DEFENSE TECHNICAL INFORMATION CENTER ALEXANDRIA VA BATTERIES.(U) NOV 79 DTIC/BIB-79-05 F/6 5/2 AD-A077 600 NL UNCLASSIFIED 1 OF 6 ADA 077600



**DTIC/BIB-79-05** 

AD-A077 600

#### **BATTERIES**

A DTIC BIBLIOGRAPHY

DTIC-TOS
Cameron Station
Alexandria, Va. 22314

**NOVEMBER 1979** 

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DEFENSE TECHNICAL INFORMATION CENTER
DEFENSE LOGISTICS AGENCY
Cameron Station
Alexandria, Va. 22314

BATTERIES

Bibliography Dec. 1960 - July 1979

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Supersedes AD-768 500

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

\*Primary batteries .

Nickel Zinc Cells Silver Zinc batteries Cathodes (Electrolytic

Alkaline batteries

\*Storage batteries \*Bibliographies

Primary Cells

Cells)

Electric batteries

Magnesium batteries

Nickel Cadium batteries Anodes (Electrolytic Cell)

20. STRACT (Continue on reverse side if necessary and identify by block number)
This bibliography is a selection of unclassified and unlimited itations on Batteries. These citations present information on deign~, cells, test, development, components, and performance characeristics. Discussed are many types of batteries, with most refernces relaking to the nickel cadmium batteries and organic batteries

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EDITION OF 1 NOV 65 IS OBSOLETE

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SECURITY CLASSIFICATION OF THIS PAGE (When Date Entered)

SECURITY CLASSIFICATION OF THIS PAGE(When Date Entered)

Continued from #19.
Lead acid batteries
Thermal batteries
Reserve batteries
Sea Water batteries
Low Temperature batteries
Mercury batteries
Dry batteries
Guided missile batteries
Metal air batteries
Battery components
Electrodes
Electrodytes
Fuel cells
Power supplies

electric particular of the control o

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#### FOREWORD

This unclassified and unlimited bibliography contains 703 citations on *Batteries*. References were selected from entries processed into the Defense Technical Information Center's AD data bank during the period of December 1960 through July 1979.

These citations give information on Batteries, in the field of design concepts, research, development, fabrication and evaluation by use of various studies and tests.

This report supersedes DDC report bibliography on Batteries, AD-768 500, DDC-TAS-73-59, dated October 1973.

Individual entries are arranged in descending AD number sequence.

Computer generated indexes of Corporate Author/Monitoring Agency,

Subject, Personal Author, and Title.

BY ORDER OF THE DIRECTOR, DEFENSE LOGISTICS AGENCY

**OFFICIAL** 

HUBERT E. SAUTER

Administrator

**Defense Technical Information Center** 

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	TITLE	ı
	PERSONAL AUTHOR P-1	ı

AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB ND-B006 344

Reserve Magnesium Batteries for Emissive Laboratory Shelf Life Tests of Primary Expendable Electronic Countermeasure DESCRIPTIVE NOTE: Final rept. 1 Apr 71-15 Jul 74, Miller, Gerald H. : 29P

"L 75 29P M NO. AFAPL-TR-75-16 AF-3145 REPT. NO

314522 PROJ: TASK:

# UNCLASSIFIED REPORT

3 Aircraft equipment, Low temperature batteries, Low temperature, Automatic, Activation, Expendable, DESCRIPTORS: (\*Magnes:um batteries, Shelf life), (\*Reserve batteries, Magnesium batteries), (\*Primary batteries, Reserve batteries), Electronic countermeasures

Ξ of automatically activated, magnesium anode batteries developed for aircraft expendable electronics countermeasure (ECM) application. Model LSP2055 batteries stored at 70F for over 12 months via evaporation resulting in a too acid electrolyte battery performance and shelf life test results, is that Model LSP2055 battery is a suitable power stored batteries lose water from their electrolyte This report presents results of shelf life testing causes necessitated some batteries to be manually activated, the general conclusion, based on fresh (continuous) demonstrated design service life as did one battery that was desk stored at about 75F Model LSP2021 batteries, similar in most respects give minimum service life. These high temperature for 45 months. However, Model LSP2055 batteries specified discharge life following 6 years desk storage at about 75F. .ithough some mechanical to Mode! LSP2055 batteries, demonstrated their stored at 130F for 12 months (continuous) and at 110F for 12 months (continuous) failed to source for aircraft ECM applications. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMOT DDC REPORT BIBLIDGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) AD-8001 851

Molybdenum-Doped Manganese Dioxide for Use in Low Temperature Battery Cathodes.

3

Valand, T. ; DESCRIPTIVE NOTE: Technical note, DRED-TN-74-30 16P NOV 74 REPT. NO. DRE

3

## UNCLASSIFIED REPORT

Electron paramagnetic resonance, X ray diffraction \*Cathodes(Electrolytic cell)), (\*Low temperature batteries, Cathodes(Electrolytic cell)), Doping, Concentration(Chemistry), Spectrophotometry, Performance(Engineering), Electrochemistry, Decomposition, Temperature, Canada IDENTIFIERS: \*Manganese dioxide, Molybdenum Molybdenum compounds, Oxides, Preparation, SUPPLEMENTARY NOTE: Abstract in French. DESCRIPTORS: (\*Manganese oxides,

trioxide

3 3

> observed in the discharge behavior of electrodes made with these oxides. The doped cathodes were assessed properfies of manganese dioxide cathodes containing molypdenum trioxide is described. The manganese dioxide was made by the decomposition of a dossolved mixture of manganous nitrate and a small quantity of composition of the manganese dioxide was affected by molybdenum thioxide. It was found that the chemical the presence of less than 1% molybdenum trioxide. In certain cases, considerable improvement was A study of the chemical and electrochemical in the Zn/H2SO4/Mr.02 reserve-primary system. (Author)

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AD-8001 851

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AD-8006 344

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SEARCH CONTROL NO. ZOMOT DOC REPORT, BIBLIOGRAPHY

-A072 142 9/3 10/3 ARMY COMMUNICATIONS COMMAND FORT HUACHUCA AZ AD-A072 142

Standard Engineering Installation Package. Uninterruptible Power Facilities (48 Volts

3

DESCRIPTIVE NOTE: Final rept. JUL 79 374P REPT. NO. ACC-SEIP-020

# UNCLASSIFIED REPORT

3 3 facilities, \*Lead acid batteries, \*Uninterruptable power generation, Army equipment, Installation, Manuals, Communication and radio systems, Diagrams, Engineering drawings, Test methods, Quality assurance, Standards IDENTIFIERS: SEIP(Standard Engineering DESCRIPTORS: \*Power engineering, \*Military Installation Package)

3 logisticians, engineers, and technicians to program, includes a discussion of principles of operation, bill of materials, installation instructions procure, engineer, and install 48-V dc uninterruptible power facilities. The SEIP (including drawings), and test procedures. This Standard Engineering Installation Package (SEIP) assists project officers,

### UNCLASSIFIED

SEARCH CONTROL NO. 20MO7 DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH

Some Observations on the Prediction of the State of Discharge of Batteries,

3

**6**P FEB 76

# Kornfeil, F.

UNCLASSIFIED REPORT

Availability: Pub. in Unl. of the Electrochemical Society, v123 n9 p1271-1276 Sep 76. (No copies urnished by DDC).

DESCRIPTORS: \*Storage batteries, \*Electric discharges, Zinc compounds, Potassium compounds, Hydroxides, Mercury compounds, Oxides, Galvanometers, Test methods, Reprints

3

Reprint: Some Observations on the Prediction of the State of Discharge of Batteries.

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AD-A070 493

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ZOM02

NAVAL SURFACE WEAPONS CENTER WHITE DAK LAB SILVER SPRING ZOM07 SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

Temperature Profile in Li/S02 Cells during Discharge.

Dallek, S.; Bis, R. F.; REPT. NO. NSWC/WOL/TR-78-213 28P

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Electric batteries, \*Lithium, \*Sulfur oxides, \*Safety, Temperature, Electric discharges, Venting, Heat, High pressure IDENTIFIERS: Lithium sulfur batteries

33

3 rates to study the distribution of heat within the cells and to determine the conditions under which Li/So2-cells have been discharged at various Li/SO2 batteries may be safely used by the Navy. (Author)

### UNCLASSIFIED

ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

EIC CORP NEWTON MASS AD-A069 846

Basic Studies of the Lithium Secondary Electrode.

3

3

DESCRIPTIVE NOTE: TECHNICAL REPT. 1 Feb 78-31 Jan 79, APR 79 27P Brummer,S. Barry; Koch, Victor R.; Goldman, Jay L.; Mank, Richard M.; Mattos, Cynthia J.; REPT. NO. C-480, TR-2 CONTRACT: N00014-77-C-0155

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: \*Storage batteries, \*Lithium, \*Corrosion inhibition, \*Electrodes, Electrolytes, Lithium compounds, Butyl radicals, Arsenic compounds, Molecular orbitals, Thermal stability, Oxides, Fluorides
IDENTIFIERS: Lithium batteries, Furan/ Tetrahydro, THF(Tetrahydrofuran), Lithium electrodes, PC(Propylene Carbonate), Lithium arsenic hexafluoride, Chemical stability, WUNR359638

to resist reduction by Li is thought to be based on the position of its lowest unfilled molecular orbital (LUMD) relative to that of THF. (Author) (MA), and tetrahydrofuran (THF)-based electrolytes yielded poor Li electrode cycling efficiencies due to the electrolyte reduction by Li. We find 2-methyltetrahydrofuran (2-Me-THF)/LiAsF6 media to be remarkably stable toward Li resulting in cycling efficiencies which particular, and alpha-methylated THFs in general, require an efficient Li electrode. Earlier work with propylene carbonate (PC), methyl acetate Rechargeable high energy density Li batteries approach 98%. The ability of 2-Me-THF in

3

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

-4068 990 10/3 NAVAL RESEARCH LAB WASHINGTON DC AD-A068 990

Improvements in the Lead-Acid Battery for Load Leveling Applications. FY78 Summary

 $\widehat{\Xi}$ 

DESCRIPTIVE NOTE: Interim rept.,
MAY 79 27P Simon,A. C.; Caulder,S.
M.; Wales,C. P.; Jones,R. L.;
REPT. NO. NRL-MR-3988

# UNCLASSIFIED REPORT

33 DESCRIPTORS: \*Lead acid batteries, \*Energy storage, Reaction kinetics, Electrodes, Electrical loads, Electric power production, Cyclic rate, Plates, Battery components, Electrochemistry, Lead oxides, Performance(Engineering)

3 This report describes research conducted in FY78 under a DoE program to improve the lead-acid battery system for load leveling at electricity-generating plants. The study has identified changes in the plate active material that occur during cycling (or service operation), viz, a progressive buildup of an electrochemically inactive Pb02 active material to a styructuraliy unfavorable coralloid form, which, if eliminated, could improve batttery performance. (Author) species, and the physical transformation of the

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AD-A068 216 10/3 20/3 DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

Nickel/Cadmium Aircraft Batteries: Practical Resistance Measurements.

3

Feldmen, Keiva ; Verville, DESCRIPTIVE NOTE: Technical note, Gaston ;Haines,Ronald L. ; REPT. NO. DREO-TN-79-2

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Summary in French.
DESCRIPTORS: \*Nickel cadmium batteries, \*Electrical resistance, Aircraft equipment, Measuring instruments, Ohmmeters, High rate, Electric current, Voltage, Laboratory tests

3

AD-A068 216

AD-A068 990

UNCLASSIFIED

SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

CALIFORNIA UNIV LOS ANGELES DEPT OF CHEMICAL UNCLEAR AND THERMAL ENGINEERING AD-A067 514

3 Theoretical and Experimental Analysis of Alkaline Zinc Batteries.

DESCRIPTIVE NOTE: Final rept. 15 Apr 76-30 Sep 78, JAN 79 186P Bennion, Douglas N. :Newman, JAN 79 186P Bennion, Douglas N John ; Sunu, Won Guen ; Ghosh, Siddhartha ;

Eliash, Bruce M. ;

CONTRACT: F44620-76-C-0098

PROJ: 2303 TASK: A1

MONITOR: AFOSR TR-79-0472

## UNCLASSIFIED REPORT

\*Mathematical analysis, Electrodes, Chemical reactions, Rates, Conce tration(Chemistry), Electrical properties, Crystal structure, Solid state chemistry, Ion exchange, Membranes, Battery DESCRIPTORS: \*Alkaline batteries, \*Zinc oxides, DENTIFIERS: PEG1102F, WUAFDSR2303A1 separators

33

In particular, the chemical reaction rates, concentration, and electrical potential distributions performance rates in non-flowing zinc electrodes for electrical storage batteries have been investigated. The processes that control the useful life time and distributions have been measured and correlated for experimentally as functions of position in the electrode and time for both charge, discharge, and multiple cycles. Changes in crystal structure and RAI P2291 ion exchange membrane separators used in experimentally and calculated theoretically, using zinc secondary batteries such as the nickle-zinc battery (An/KOH, H2O/NiGOH). Distributions solid distributions have also been measured and the copper deposition reaction for experimental have been predicted theoretically and measured convenience. Work was begun on the theoretical in flow through electrodes were also observed examined theoretically. Similar rates and description of the nickle oxide electrode.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

AD-A067 210 10/3 AEROSPACE CORP EL SEGUNDO CALIF CHEMISTRY AND PHYSICS

Evaluation of Liquid-Gas Separator Materials for a Silver Zinc Cell Vent.

3

Badcock, Charles C.; DESCRIPTIVE NOTE: Final rept., 20P

Zimmerman, Albert H. ; REPT. NO. TR-0079(4970-10)-2 CONTRACT: F04701-78-C-0079 SAMS0 TR-79-23 MONITOR:

# UNCLASSIFIED REPORT

separators, Vents, Gases, Liquids, Fluorinated hydrocarbons, Polyethylene, Porous materials, Permeability, Potassium compounds, Hydroxides, \*Silver zinc batteries, \*Battery DESCRIPTORS:

Teflon DENTIFIERS:

33

polyethylene, and microporous Teflon was measured in order to evaluate the suitability of these materials for use as liquid-gas separators for silver zinc cell vents. Microporous Teflon was found to permeability, it is not wetted by electrolyte, and it Microporous Teflon is recommended as the material of choice for liquid-gas separators in silver zinc has a negligible permeability to KOH electrolyte. The gas permeability of TFE Teflon, FEP Teflon, have ideal characteristics for a liquid-gas separator. This material has a high gas battery celis. (Author)

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AD-A067 210

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AD-A067 514

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SEARCH CONTROL NO. ZOMOT DOC REPORT BIBLIDGRAPHY

NORTHWESTERN UNIV EVANSTON ILL MATERIALS RESEARCH AD-A066 924 CENTER Basic and Applied Research in Materials.

3

DESCRIPTIVE NOTE: Final rept. 1 Jul 76-30 Jun 77, CONTRACT: N00014-75-C-1116, ARPA Order-3017

# UNCLASSIFIED REPORT

Electrodes, Electrolytes, Ionic current, Electric conductors, Catalysts, Heterogeneity, Energy storage, Platinum, Silicon dioxide, X ray diffraction, Isotope exchange, Deuterium ion concentration, Cyclopentanes
[DENTIFIERS: WUNR056606 DESCRIPTORS: \*Storage batteries, \*Catalysis,

the support upon the catalyst behavior, the effect of and the effect of the method of catalyst preparation metallic particle size on catalytic characteristics pt/Si02 catalysts were prepared and characterized utilizing a variety of techniques, e.g., x-ray diffraction, isotopic exchange between deuterium and cyclopentane, etc. The purpose of these studies is to elucidate information on the nature of the catalyst crystallites, the effect of heterogeneous catalysis and materials for energy storage. In the first project, standard batches of upon catalytic activity. The results of the final sets of measurements are presented. Research has been carried out in two areas:

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY AD-A066 378

)-A066 378 10/3 HONEYWELL POWER SOURCES CENTER HORSHAM PA Safety Studies of Lithium-Sulfur Dioxide

DESCRIPTIVE NOTE: Final rept. 31 Aug 77-31 Mar 78, 55P Cells.

3

Blagdon, L. J. ; Randall, B. DAAB07-77-C-0459 FEB 79 CONTRACT:

MONITOR: DELET TR-77-0459F PROJ: 1F263702DG10 TASK: 01

## UNCLASSIFIED REPORT

\*Sulfur oxides, Safety, Processing, Cathodes(Electrolytic cell), Hermetic seals, DESCRIPTORS: \*Electric batteries, \*Lithium, IDENTIFIERS: Sulfur dioxide, WU218, ASG10, Configurations, Density, Concentration (Chemistry)

33

3 3

cathode development contributed most to improving the and tested to improve safety during use/abuse conditions. Variables evaluated were wrap configurations, cathode processing, cathode density, lithium content and SO2 concentration. At 2A constant current, at -20 deg F and room temperature, respectively, no venting occurred to 200% of the theoretical SO2 content. Discharge efficiency had the most influence on the safety and Hermetically sealed SO2 'D' cells were fabricated overall cell efficiency. (Autho)

3

AD-A066 924

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY COLO AD-A065 286

Discharge Characteristics of LiAl/ NaAlCl sub 4/FeCl sub 3 Thermal Ce113.

3

Vaughn, Robert L. ; King, DESCRIPTIVE NOTE: Technical rept., 33P FEB 79 Lowell A.

FJSRL-TR-79-0001

2303 PROJ: TASK:

## UNCLASSIFIED REPORT

33 ESCRIPTORS: \*Thermal batteries, \*Reserve batteries, Lithium alloys, Aluminum alloys, Chlorides, Intermetallic compounds, Iron compounds, Sodium compounds, Electrochemistry, Anodes, Electrolytes, IDENTIFIERS: PEGI102F, WUFUSRL2303F207 Electric discharges DESCRIPTORS:

3 Pelletized thermal battery single cell experiments electrochemical system. The cells were optimized discharge rate to produce maximum energy output. for anode, eletrolyte, and cathode composition. The cell discharge behavior was characterized, defining optimum conditions of temperature and are described for the lithium-aluminum/sodium tetrachloroaluminate/iron(III) chloride

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

54064 554 7/4 11/6 10/3 STATE UNIV OF NEW YORK AT BUFFALD DEPT OF CHEMISTRY AD-A064 554

Fundamental Solid Electrode Studies Related to Corrosion Prevention, Fuel Cells and Batteries.

3

DESCRIPTIVE NOTE: Final rept. 1 Aug 73-15 May 78, MAY 78 17P Bruckenstein, Stanley; CONTRACT: AFOSR-74-2572

PROJ: 2303 TASK: A1

TR-79-0003 MONITOR: AFOSR

# UNCLASSIFIED REPORT

ESCRIPTORS: \*Electrodes, \*Corrosion, \*Corrosion inhibition, \*Electrochemistry, Metal films, Deposition, Films, Thallium, Mercury, Silver, Fuel cells, Electric batteries, Carbon monoxide, Adsorption, Gold, Platinum, Mercury alloys, Copper alloys, Nickel alloys DESCRIPTORS:

DENTIFIERS: PEG1102F, WUAFDSR2303A1

33

propare solutions with extremely low levels of poisoning substances, to distinguish between surface and mass transport controlled processes, and to perform quantitative studies at the micromolar levels of electroactive species that arose in our studies. Underpotential deposition, UPD, of thallium, mercury and silver on gold have resulted in the electrochemical techniques were developed specifically for the purpose of studying such surface processes. These techniques made it possible to highly precise determination of the electrosorption The study of surface phenomena at solid electrodes determination of accurate adsorption isotherms and valency. Electrosorption valency values for silver show a minimum near a surface coverage of 0.5. No research. In particular, three kinds of surface processes were investigated: (1) corrosion processes was the major goal of this related to electrochemical power sources and Underpotential metal deposition, (2) neutral species adsorption and (3) insoluble film minimum has ever been discovered before. formation. New electroanalytical and

AD-A064 554

UNCLASSIFIED

3

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

MALLORY BATTERY CO TARRYTOWN N Y AD-A064 327

Primary Lithium Organic Electrolyte Battery BA-5090 ( )/U, BA-5585 ( )/U, BA-5598 ( )/U.

3

DESCRIPTIVE NOTE: Final rept. 1 May 76-30 Dec 78, DEC 78 113P Barnella, J. :Kumbhani, M. ; CONTRACT: DAAB07-76-C-1735 MONITOR: DELET TR-76-1735-F

# UNCLASSIFIED REPORT

33 SUPPLEMENTARY NOTE: Original contains color plates: All DDC reproductions will be in black and white. DESCRIPTORS: \*Primary batteries, \*Electrolytic Hermetic seals, Fabrication IDENTIFIERS: BA-5090 battery, Sulfur dioxide cells, \*Lithium, \*Sulfur oxides, Dioxides, Vents, Electrodes, Electrolytes, Safety,

capacity optimization. Hermetically sealed cells and hatteries already in production were utilized as the basic test vehicles. The objective of this program was to design and develop a new cell for use in the BA-5090 battery. Due to its unique size concern throughout this section was to maximize utilizable capacity while complying with design evaluation of potential vent design changes for this LO37S cell required special manufacturing techniques not previously developed. Primary The primary objective of this program was to investigate the effects of variations of cell component ratios on cell safety and electrical performance. Inc.uded in these studies was the criteria developed in Section 1. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY AD-A064 290

CHRYSLER CORP NEW ORLEANS LA MICHOUD DEFENSE-SPACE 10/3

Development of a NICAD Battery Interface

3

DESCRIPTIVE NOTE: Final rept. Jul 76-May 78, DEC 78 75P Stephens, Earnest; CONTRACT: DAAJO2-76-C-0054 PROJ: 1F262209AH76

TR-78-47 MONITOR: USARTL

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, \*Battery chargers, \*Monitors, Army aircraft, Aircraft equipment, Aircraft maintenance, Interfaces,

Monitoring [DENTIFIERS: PE62209A, ASH76, WU159

33

charge and monitor the status of nickel-cadmium batteries and is an onboard unit that can be readily that would reduce battery maintenance cost, increase system. The initial portion of the multitask program involved definition of candidate approaches, current approach selected as optimum. S'x BIU's were then fabricated, three to operate with an AC input and three to operate from a DC input; they were subjected to a variety of performance and environmental tests to demonstrate performance. The objectives of the program were to develop a system analysis to select the optimum approach, and design built which meets these objectives and which can be packaged within weight and volume limits compatible battery-related safety hazards. The results of the the useful life of NICAD batteries, and eliminate of a system to implement the multilevel, constant integrated with the existing aircraft electrical This report describes the effort to develop and program clearly demonstrated that a BIU can be on Army aircraft. The BIU provides a means to test a Battery Interface Unit (BIU) for use with onbaord aircraft usage. (Author)

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AD-A064 327

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AD-A064 290

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ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND 10/3 FORT BELVOIR VA AD-A063 661

3 Baseline Tests of the Daihatsu EH-S40 Electric Delivery Van.

DESCRIPTIVE NOTE: Final technical memo.,
AUG 78 62P Dowgiallo, Edward J., Jr.;
Bailey, Cornelius E., Jr.; Snellings, Ivan R.;

EC-77-A-31-1042 Blake, William H. ; REPT. NO. MERADCOM-2256 DOE CONTRACT: MONITOR:

CONS/0421-2

# UNCLASSIFIED REPORT

Transmissions(Mechanical), Acceleration, Braking, Road tests, Performance(Engineering), Range(Distance), State of the art IDENTIFIERS: 1/4-TON TRUCKS DESCRIPTORS: \*Trucks, \*Electric automobiles, \*Electric batteries, Traction, Delivery, Vans, SUPPLEMENTARY NOTE: See also AD-A056 927. Japan, Foreign technology,

540 Van is manufactured in Osaka, Japan, by Daihatsu Motor Co., Ltd. The van is powered by eight 12-volt batteries that are connected to the motor through an arrangement of contactors operated with a transistor shunt field control. The motor is connected via a clutch to a four-speed manual transmission. No regenerative braking was provided. from a foot pedal. The motor is a compound type facilities in Aberdeen, Maryland, as part of a quarter-ton delivery truck, was tested at the U.S. Army Aberdeen Proving Ground test characterize the state-of-the-art o. electric results are presented in this report. The EHvehicles. The EH-S40 Van performance test Department of Energy (DDE) project to The Daihatsu EH-S40 Van, an electric

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ZOMO2 SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND FORT MONMOUTH NJ ELECTRONICS TECHNOLOGY/DEVICES LAB 10/3 AD-A063 108

Electrodes in Nonaqueous Electrolytes. The Behavior of Molybdenum Trioxide

3

DESCRIPTIVE NOTE: Technical rept., nct 78 20P Hunger, Herbert F.; Ellison, Joseph E. ;

REPT. NO. DELET-TR-78-23 PROJ: 1L161102AH47 1L161102AH47

# UNCLASSIFIED REPORT

\*Cathodes(Electrolytic cell), \*Storage batteries, Electrolytes, Transition metal compounds, Chalcogens, Molybdenum compounds, Oxides, Carbonates, Acetonitrile, Perchlorates, Lithium DESCRIPTORS: \*Electrolytic cells, \*Electrodes, Electron transfer, Electrochemistry, Reaction kinetics, Organic compounds, Lithium, Propane, compounds

IDENTIFIERS: Molybdenum trioxide, PE61102A, ASH47, WU491

33

3 3

3 followed by a slow diffusion step which becomes rate determining at practical current densities. Experimental work with molybdenum trioxide cathodes in organic electrolytes was aimed at increasing the cathodic rate capability of the electrodes. Coulombic analysis of cycling experiments suggests considerable increase in rate capability up to 25 characterized by a fast electron transfer step a high coulombic efficiency up to 1.5 F per molybdenum atom. The cathode kinetics is Electrolyte solvent optimization led to a mA/sq cm. (Author)

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY -A062 949 10/3 DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER ANNAPOLIS MD PROPULSION AND AUXILIARY SYSTEMS DEPT

3 Electrochemical Lithium Power Systems for

Hydrospace.

DESCRIPTIVE NOTE: Research and development rept., JAN 74 35P Urbach, H. B.; Cervi, M. C.; Icenhower, D. E.; AFPT. NO. DINSRDC-PAS-27-415

# UNCLASSIFIED REPORT

\*Water activated batteries, \*Lithium, Anodes(Electrolytic Gell), Electrolytes, Lithium compounds, Hydroxides, Energy storage, High density. Thermal properties, Efficiency, Experimental design

DENTIFIERS: Lithium hydroxide, Energy density

temperature and cell configuration on the voltage, efficiency, and power output were studied. Energies exceeding 1500 watt-hours per pound of lithium were obtained at powers of 160 watts per square foot, provided that the lithium hydroxide concentration and configurations were studied, all having a square foot temperature were maintained at the optimized values. by increasing product solubility and decreasing activation losses. Studies of concentration effects indicate that maximum energy utilization of lithium can be achieved between 3.50 and 3.70 molar lithium hydrogen self-dischange. However, higher temperature increases the amount of power available were constructed and operated safely. The effect of lithium hydroxide electrolyte concentration hydroxide concentration at temperatures between 15 drawn from the cell. Elevating temperatures above and 25 C. From the experimental data, a study was made of various multiple cell arrangements. Three Electrochemical cells consuming lithium and water 25 C tended to lower efficiency by increasing the Coulombic efficiency increases as more power is of single cell area and varying cell thickness.

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

0-A062 708 10/3 MALLORY (P R) AND CO INC BURLINGTON MASS LAB FOR PHYSICAL SCIENCE AD-A062 708

3 Safety Studies of Lithium-Sulfur Dioxide Cells.

DESCRIPTIVE NOTE: Final rept. 1 Sep 77-30 Apr 78, NOV 78 51P Dey, A. N. ;1

CONTRACT: DAAB07-77-C-0458 PROJ: 1F263702D610 TASK: 01

DELET MONITOR:

# TR-77-0458-F

UNCLASSIFIED REPORT

\*Sulfur oxides, Experimental design, Safety, Performance(Engineering), Electrolytic cells, \*Electric batteries, \*Lithium, DESCRIPTORS: High energy

> 3 3

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DENTIFIERS: \*Lithium sulfur dioxide cells, Abuse resistance, Sulfur dioxide, AS610, WU218, IDENTIFIERS: PE63702A The objective of this program was to improve the abuse resistance of Li/SO2 cells. LO26S cells were cho.en for the study. We studied the effect of cell design variables such as Li:SO2 ratio, electrode configuration and electrolyte compositions on the abuse resistance as well as the performance of the LO26S cells in order to establish the trade-offs between the cell performance and the increased identified. The cell design variables did not appear to have any significant effect on the abuse resistance of cells for abuses such as charging. In general LO26S cells of all designs were abuse penalty. Several design principles contributing to the safety of the Li/S02 cells have been discharge at -30C. This design entails a capacity penalty of approximately 3 A.Hr at low rates over which improved the abuse resistance of the L026S cells for abuses consisting of a 24 forced resistant towards charging at currents below 2A. abuse resistance. We found several cell designs the standard LO26S cells. However, at high rates (2A or more) there was no capacity

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(Author)

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### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

On the Selection of Electrolytes for High Energy Density Storage Batteries,

3

Klochko, Michael A.; Casey, · 57P REPT. NO. DREG-785 Edmound J. :

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Abstract in French.
DESCRIPTORS: \*Storage batteries, \*Nonaqueous electrolytes, High density, HIgh energy, Fused salts, Anodes, Solid electrolytes, Electrical conductivity, Metals, Deposition, High temperature, Solvents, Canada

overcome the shortcomings of these systems, viz. low conductivity of the electrolyte, poor quality of the anodic metal deposited during recharging of the nonaqueous systems, high operating temperatures, of the molten salts and instability of solid-state electrolytes, are considered. Electrolytes with are suggested for examination in secondary battery systems with each of the six light anodes mentioned compositions in the transition region between the pure electrolyte and its solutions in the solvent, electrolytes for high energy density storage batteries (SB's) with anodes of Li, Na, Ca, Mg, Al and Ti, is discussed. Means to The use of nonaqueous, molten salt and solid above. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

10/3 7/4 13/12 AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB AD-A062 031

An Indicator for the Detection of Sulphur Dioxide from Cells and Batteries.

3

DESCRIPTIVE NOTE: Final rept. Mar-May 78, OCT 78 20P Cloyd, James S.; REPT. NO. AFAPL-TR-78-79

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates: DDC reproductions will be in black and white. \*Leakage(Fluid), \*Venting, \*Sulfur oxides, Warning systems, Thionyl chloride, Sulfonyl halides, Cathodes(Electrolytic cell), Potassium Compounds, Chromates, Silicon, Rubber IDENTIFIERS: WUAFAPL31452233, PE62203F DESCRIPTORS: \*Indicators, \*Primary batteries,

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This report presents the results of the experimentation for the development of a chemical indicator for use in the detection of sulfur dioxide. This indicator has application for use with lithium-sulfur dioxide cells/batteries and with cells and batteries in which thionyl chloride or sulfuryl chloride is used as the active cathode. A depletion or sulfur dioxide from a lithium-sulfur dioxide cell chloride undergo hydrolysis in ambient humidity and of battery with subsequent use may produce unsafe conditions for the user. Both thionyl and sulfuryl Produce amounts of sulfur dioxide. This indicator venting in these types of cells and batteries and can be used as a warning device for leakage or consists of potassium chromate adsorbed onto a silicon powder with subsequent suspension in a silicon rubber material. (Author)

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) 10/2 AD-A061 609

Power Supplies for Arctic Radio Repeater Systems,

3

Nagy, Gerald D. REPT. NO. DREG-R-787 50 P

## UNCLASSIFIED REPORT

Maintenance, Requirements, Lead acid batteries, Fuel cells, Thermoelectric power generation IDENTIFIERS: Arctic Radio Repeater Systems, \*Radio stations, \*Power supplies, Costs, Arctic regions, Feasibility studies, Foreign technology, Canada, Reliability, Zinc air batteries DESCRIPTORS:

3 3

This feasibility study assesses various long-lived, self-contained 30-watt power supplies for an Arctic Radio Repeater System. The study involves a review of the state-of-the-art, availability and cost of five candidate systems; batteries, fuel cells, since the application calls for one year unattended operation and servicing by light helicopter on a single annual flight for all sites. Only zinc/air batteries with lead/acid batteries for the standby system are available now. Their cost is moderate, service and maintenance requirements are considered each year. Other systems could be available in the 1980's but they would require various amounts of development of the systems which could replace the but zinc/air cells are heavy and must be replaced radioisotopic thermoelectric generators, fueled environment. Recommendations and priorities for thermoelectric generators and windmill-battery assessed as standby power units. Reliability, systems. The above five candidates were also development work and evaluation in an arctic zinc/air cells at a later date are given.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMOT DDC REPORT BIBLIDGRAPHY

EIC CORP NEWTON MASS AD-A061 426

Silver-Hydrogen Energy Storage.

3

DESCRIPTIVE NOTE: Final rept. 15 Jun 76-15 Jun 78, AUG 78 236P Holleck,G. L. ;Turchan,M. AUG 78 236P Holleck,G. L. ;Turchan,M. J. ;Shuker,F. S. ;DeBiccari,D. ;Turner,M.

CONTRACT: F33615-76-C-2093

PROJ: 3145 TASK: 21

MONITOR: AFAPL

# UNCLASSIFIED REPORT

\*Hydrogen, Electrodes, Battery separators, Electric discharges, Life cycle testing, Mathematical models, Computerized simulation, Optimization, Electrolytes, Silver oxides, Membranes, Transport properties IDENTIFIERS: PE62203F, WUAFAPL31452130 \*Storage batteries, \*Silver, DESCRIPTORS:

33

demonstration and the necessary development involved evaluation using several sets of laboratory cells of approximately 15 Ah in addition to the development of a comprehensive computerized mathematical model for the design and optimization of Ag/H2 cells of During this program we have demonstrated the feasibility of Ag/H2 cells with 35 to 50 Wh/1b, depending on the desired discharge rate, and with a characteristics is required to maintain an adequate electrolyte balance during any one charge-discharge electrolyte transport properties described by their rolled stack configuration. Electrolyte management was identified as the main problem area. The extensive component level studies and performance cycle life in excess of 500 deep discharges. This relatively high solubility of silver oxide in the electrolyte necessitates the use of argentistatic Suitable combination of the individual transport transference, diffusion and flow parameters. We determined those parameters and showed that a membranes similar to those employed in Ag/Zn cells. These membranes have characteristic

AD-A061 426

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cycle and from cycle to cycle.

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SEARCH CONTROL NO. ZOMO7

Flywheel Components for Satellite Applications.

Millner, Alan R. DESCRIPTIVE NOTE: Technical note REPT. NO. TN-1978-4 CONTRACT: F19628-78-C-0002

MONITOR: ESD TR-78-97 PROJ: 649L

UNCLASSIFIED REPORT

3 \*Attitude control systems, Communication satellites, Antifriction bearings, Motor generators, Nickel \*Flywheels, \*Energy storage,

cadmium batteries, Stators, Rotors, Spaceborne IDENTIFIERS: Magnetic bearings, Nickel hydrogen batteries, High speed flywheels, Composite rotors, Filament rotors, PE6570:

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using high-speed flywheels with magnetic bearings in communications spacecraft. Hardware point designs have been completed for a very low drag bearing and a the results of these designs, a tradeoff study compares these flywheels with combinations of Nicd batteries, NiH2 batteries, and conventional low-speed momentum wheels. Section I presents the tradeoff studies for flywheels used for energy storage only, for attitude control only, and combined energy storage and attitude control. combined power and attitude control, but not much he results show that such wheels look excellent The following paper studies the possibilities of for attitude control alone (as high-speed, high-reliability momentum wheels) and attractive for

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better than NiH2 for power alone.

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ELECTRONICS ENGINEERING GROUP (1842ND) SCOTT AFB IL Lead Calcium Battery Cell Servicing and

Charging Problems and Procedures.

3

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DESCRIPTIVE NOTE: Technical rept., SEP 78 10P Bennett, Thomas A. REPT. NO. 1842-EEG/EEIS-TR-78-15

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Electric batteries, \*Electric charge, \*Maintenance, Lead(Metal), Calcium, Electrolytes, Electrolytic cells, Air Force equipment

3

Lead calcium battery cell charging problems were experienced in the field. Record data was submitted for review and recommendations. This report provides an analysis of the problem and recommends servicing and initial charging procedures. (Author)

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UNCLASSIFIED

AD-A060 586

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

0-4060 422 10/3 CIVIL ENGINEERING LAB (NAVY) PORT HUENEME CALIF

Performance of Lead-Acid Geiled Electrolyte Batteries in the Deep Ocean Environment.

3

DESCRIPTIVE NOTE: Final rept. Oct 77-Sep 78, Briggs.W. D. ; 27P

CEL-TN-1526 61512 PROJ:

ZF61512001

# UNCLASSIFIED REPORT

33 \*Electrolytes, Deep oceans, High pressure, Low temperature, Performance(Engineering)
DENTIFIERS: WU079, PE62766N \*Lead acid batteries, \*Gels, IDENTIFIERS:

3 Standard lead-acid batteries with liquid electrolyte experience dramatic capacity losses when charged and discharged under deep ocean conditions. were divided into control and test groups. The test groups were modified to allow pressure compensation with white mineral oil. The performance of the capacity loss is significantly less than the 35-70% batteries in similar conditions. Thus, lead-acid batteries with gelled electrolyte were found to be Recently developed commerical lead-acid batteries test battiers was not degraded by exposure to the mineral oil or high pressure (10,000 psig). An average loss of capacity of 10% was experienced when the batteries were cycled cold (32 degree F) and at pressure (10,000 psig). However, this loss experienced in previous tests with standard with gelled electrolyte were tested to determine their performance at high pressure and low temperature. Batteries from three manufacturers suitable for use in deep ocean conditions in a pressure compensated mode. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIBGRAPHY SEARCH CONTROL NO. ZOMO7

HONEYWELL INC HOPKINS MINN

Mini-Refraction Sonde Field Tests.

3

Motchenbacher, Curtis D.; DESCRIPTIVE NOTE: Final summary rept., DEC 77 60P Mo: CONTRACT: N62269-76-C-0368 60P

MONITOR: NADC 76128-30-8 PROJ: F52551 TASK: WF52551734

### UNCLASSIFIED REPORT

tests, Flight testing, Mathematical analysis, Lightweight, Meteorological balloons, Thermistors, \*Radiosondes, \*Refraction, \*Field Hygristors, Humidity, Measurement, Pressure measurement, Barometers, Electric batteries IDENTIFIERS: Sonde, Pibal balloons, Lithium battery, PE62759N, WURG701 DESCRIPTORS:

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The purpose of this program is to demonstrate that

3 minisonde uses a rod thermistor for temperature and carbon hygristor for humidity measurement. For pressure measurement, a Honeywell silicon diaphragm barometer was used. This sensor uses a silicon electronically time-commutated on a 400-millisecond cycle. A lightweight telemetry transmitter provides battery. Laboratory measurements demonstrate an rms pressure. Flight tests show good operation and good it is feasible to build a small, lightweight meteorological sonde capable of measuring index of refraction (Mini-Refraction Sonde), which can be launched with a 30-gram Pibal balloon. This 1/2 watt at 400 megahertz. Power is from a lithium agreement with radar and Rawinsonde measurements. accuracy of 0.5 C temperature and 0.8 millibar diaphragm on an evacuated chamber with strainsensitive resistor sensing. The sensors are Author)

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ZOMO2

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

13/2 10/3 1/3 VERSAR INC SPRINGFIELD VA AD-A059 512

Investigation of the Environmental Consequences of Disposal of the Lithium Organic-Electrolyte/SO2 Battery.

3

DESCRIPTIVE NOTE: Final rept. Sep 76-Jan 78,
MAR 78 123P Crumrine, K. ; Juergens, E. ;
Colburn, C. ; Slimak, M. ; Freed, J. ;

DAAB07-76-C-1752 ECOM 76-1752-F CONTRACT: MONITOR:

# UNCLASSIFIED REPORT

33 SUPPLEMENTARY NOTE: Supersedes AD-A053 194. DESCRIPTORS: \*Lithium compounds, \*Organic compounds, \*Sulfur compounds, \*Storage batteries, \*Solid wastes, \*Waste disposal, Environmental tests, Electrolytes, Toxicity, Sulfur oxides, Acetonitrile, Bromides, Cyanides, Land areas,

Ponds, Soil tests (DENTIFIERS: LPN-DA-08-6-04586-01-C9-CA

3 composition cell and 1.6 mg in an undischarged cell.
Soil leachate column tests showed significant
quantities of cyanide in the leachate from discharged recommendations for the standard cell include secured constituents and laboratory analysis of leachate and landfills or disposal ponds. Laboratory analysis of solubility tests showed an average of 0.16 mg of cyanide per cell in the discharged modified Laboratory analysis identified an average of 22 mg of cyanide ion per cell in the discharged standard composition cell. Disposal recommendations for the This report contains recommendations for disposal solubility tests from cross-sectioned batteries. (standard composition and modified composition) of lithium organic-electrolyte/502 batteries based upon a review of toxicity of battery standard composition cells. Disposal equivalent. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC. REPORT BIBLIOGRAPHY

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT 10/3

Nickel-Zinc Battery for Aircraft and Missile Applications.

3

DESCRIPTIVE NOTE: Final rept. 14 Feb 75-14 Feb 78, APR 78 146P Brown,Robert A.; CONTRACT: F33615-75-C-2004

PROJ: 3145

MONITOR: AFAPL

# UNCLASSIFIED REPORT

\*Storage batteries, \*Low temperature batteries, \*Guided missile batteries, Aircraft equipment, Nickel, Zinc, Life cycle testing, Performance(Engineering), Remotely piloted DESCRIPTORS:

vehicles, Costs IDENTIFIERS: Nickel zinc batteries, PE62203F, WUAFAPL31452267

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size and weight as the nickel-cadmium battery, but is rated at 45 AH capacity vs. 22 AH for the nickel-cadmium. Cycle life of 200 cycles (20 amperes for battery has been developed to compare to the standard low temperature/high rate performance as compared to higher capacity than the silver-zinc battery at room compare to existing lead-acid and silver-zinc batteries. These vehicles require a limited number of cycles at a high energy density and are a logical application of the nickel-zinc system. For missile has been developed which exhibits an improvement in capability allow the nickel-zinc battery to exhibit remotely activated silver-zinc battery. Reductions 1 hour) have been demonstrated in a configuration capable of delivering 1000 ampere discharge at -20 F. Nickel-zinc batteries were also manufactured for remotely piloted vehicle (RPV) applications to the standard nickel-cadmium aircraft battery (MS-For aircraft applications, a nickel-zinc battery in the amount of separator needed for wet stand applications, a remotely activated nickel-zinc 24497-5). The nickel-zinc battery is the same

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temperature discharge. (Author)

SEARCH CONTROL NO. 11/6 DDC REPORT BIBLIDGRAPHY

FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY COLO AD-A058 121

3 New Low Temperature, High Energy Density Battery Systems.

Charles L. ; Nardi, John C. ; Hussey, REPT. NO. FUSRL-TR-78-0007 DESCRIPTIVE NOTE: Technical rept.,

2303

### UNCLASSIFIED REPORT

Presented at the AFSC S and E Symposium, 28-29 Oct 77, Wright-Patterson AFB, SUPPLEMENTARY NOTE:

DESCRIPTORS: \*Thermal batteries, \*Aluminum alloys, \*Transition metal compounds, \*Chlorides, Low temperature, High energy. Lithium chlorine cells, Copper compounds, Molybdenum compounds, Reserve batteries, Prototypes, Chemical reactions, Electrolytes, Cathodes, Graphite, Silicon DENTIFIERS: WUFUSRL2303F207, PE61102F dioxide, Current density

33

3 densities from 2-120 milliamps per square centimeter constructed laboratory prototype thermal battery single cells which utilize the inherent high energy Irilayer pellets were constructed incorporating the is completely immobilized by the addition of finely current density characteristics of the two systems. ntimate contact with a graphite current collector. to evaluate the operational temperature ranges and tetrachloroaluminate electrolyte. The electrolyte of reaction of aluminum and aluminum alloys with transition metal chlorides. The individual cells are comprised of an aluminum or lithium-aluminum divided silica. The cell cathode is either molybdenum pentachloride or cupric chloride in behavior was studied from 175-275 C at current anode, electrolyte and cathode. The discharge The thermal battery work unit of the Frank J. alloy anode and an immobilized liquid sodium Seiler Research Laboratory (AFSC), USAF Academy, CO, has conceived, designed, and

AD-A058 121

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AD-A056 769

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### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) AD-A056 769

Nickel/Cadmium Aircraft Batteries: Experience with Celgard Barrier Layers at

3

Feldman, Keiva ; Verville, Technical note, 16P DESCRIPTIVE NOTE: MAR 78

DRE0-TN-78-6 Gaston ; REPT. NO.

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, \*Barriers, \*Battery separators, \*Polymeric films, Layers, Cellophane, Porous materials, Polypropylene, Life cycle testing, Failure, Test methods, Aircraft equipment, Canada IDENTIFIERS: Celgard, Float charge tests Abstract in French. SUPPLEMENTARY NOTE:

33

variations in characteristics but most of them were laboratory experience which illustrates the ability of the Celgard to withstand severe usage are given. conventional cellophane barrier layer in the separators. The cellophane deteriorates especially not studied in detail. Problems may be experienced oxidizing environment in the cell even at elevated with deterioration of wetting characteristics but for the cellophane and can readily withstand the temperatures. Celgard is available with several Tests have shown that Celgard, a polypropylene microporous polymeric film manufactured by the Celanese Plastics Company, can be substituted these do not appear to be serious. Examples of rapidly :n the cells at elevated temperatures. batteries as a result of deterioration of the Problems arise with nickel/cadmium aircraft (Author)

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND FORT BELVOIR VA

Hybrid Power Source for Vehicular Propulsion,

3

Dowgiallo, Edward J. ; UNCLASSIFIED REPORT 14P JUN 78

DESCRIPTORS: \*Electric propulsion, \*Electric power, \*Hybrid systems, \*Fuel cells, \*Vehicle equipment, \*Storage batteries, Electromagnetic drives, Sources, Military vehicles, Electrical loads, Passenger vehicles, Forklift vehicles, Requirements

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD-A056 370 10/3 11/1 MALLORY (P.R.) AND CO INC BURLINGTON MASS LAB FOR PHYSICAL SCIENCE

Sealed Primary Lithium-Inorganic Electrolyte Cell.

3

DESCRIPTIVE NOTE: Final rept. 1 Mar 74-31 Jul 77 and Oct 77-3; Mar 78, Jul 78 249P Dey, A. N.; CONTRACT: DAAB07-74-C-0109

TR-74-0109-F PROJ: 1L162705AH94 TASK: P1 MONITOR: DELET UNCLASSIFIED REPORT

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DESCRIPTORS: \*Primary batteries, \*Hermetic seals, Lithium compounds, Thionyl chloride, Electrolytes, Electrolytic cells, Lithium chlorine cells, Aluminum compounds, Sealed systems, High energy, High density, Explosions, Differential thermal analysis, Storage, Performance(Engineering)

IDENTIFIERS: PE62705A, ASH94, WU214

33

This report summarizes the R and D activities carried out by P.R. Mallory and Co. on the development of a primary Li/SOC12 D cell from March 1974 to July 1977 and October 1977 to March 1978. The original objective of this program was to develop a D cell which is storable and operable in the temperature range of -40 to 160 F and is capable of delivering in excess of 150 WHr/1b at the thirty hour rate and peak power density of 50 watts/1b and a capacity degradation of less than 10% after one month of storage at 160

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AD-A056 427

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

-4055 219 10/3 ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH N J AD-A055 219

3 Primary Batteries Session Catalyzed Removal of Hydrogen from Electronic Equipment.

Gilman, S. ; Bramhall, P. 4

UNCLASSIFIED REPORT

3 Supplementary NOTE: Reprinted from Annual Proceedings Power Sources Conference (27th), Jun 76. DESCRIPTORS: \*Magnesium batteries, \*Hydrogen, Removal, Catalysis, Radio equipment, AN/PRC-77, Conferencing(Communications), Reprints

UNCLASSIFIED

SEARCH CONTROL NO. ZOMOT DDC REPORT BIBLIDGRAPHY

)-A055 184 10/3 ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH AD-A055 184

Lithium Batteries Session. Behavior of Li/ SD2 Cells Under Forced Discharged,

3

Di Masi, Gabriel

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Reprinted from Annual Proceedings Power Sources Conference (27th), Jun 76. DESCRIPTORS: \*Lithium, \*Sulfur oxides, \*Eattery components, Electrochemistry, Chemical reactions, Temperature, Pressure, Voltage

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH 10/3 AD-A055 182

Alternate Power Sources Session. Nuclear Battery Mybrid Configuration Study.

 $\hat{\Xi}$ 

Guazzoni, Guido; 4 4

# UNCLASSIFIED REPORT

33 SUPPLEMENTARY NOTE: Reprinted from Annual Proceedings thermoelectric devices, \*Nickel cadmium batteries, Plutonium, Half life, Alpha particles, Short range(Distance), Sintering, Low power, Oxides, Shock resistance, Thermal shock, Radiation protection, Hybrid systems Power Sources Conference (27th), Jun 76. ESCRIPTORS: \*Power supplies, \*Radioisotope DESCRIPTORS:

requirement for continuous, troublefree operation led to the investigation of the military potential of radioisotope thermoelectric power sources, with specific interest in a hybrid configuration using a sealed nickel-cadmium battery. By using the nuclear particle emission energy of radioactive decay, nuclear battery devices have the highest stored energy density of any other power source. However, the power output is low being related to the emission half-life of the isotope. Attainment of inherently good device power regulation requires a relatively long life isotope. Plutonium-238 (Pu-238), an is safe to use under all anticipated extremes of heat and shock. (Author) offers a very low emission hazard and, when properly encapsulated in a sintered oxide fuel form, it provides an almost ideal isotopic heat source which has become available in practical quantities. It unattended, extended periods of time. The energy Power source requirements for worldwide military (milliwatts average power) under conditions for applications include a need for low level power 86-year half-life alpha (short range) emitter, content needed in such applications and the

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH 10/3 AD-A055 181

Secondary Batteries Session. Monitor/ Control and Warning Systems for Aircraft Nickel-Cadmium Batteries,

3

Sulkes, Martin J. 44 78

# UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Reprinted from Annual Proceedings Power Sources Conference (27th), Jun 76.
DESCRIPTORS: \*Monitors, Nickel cadmium batteries, Heating, Overload, Warning systems

AD-A055 182

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO?

DEFENCE RESEARCH ESTABIISHMENT OTTAWA (ONTARIO) 17/1

Electrode. Part II. Evaluation of the Cathode for an Eight Hour Sonobuoy The AIRI Fusion Cast Lead Chloride

Donaldson, George J. ; Barnes, DESCRIPTIVE NOTE: Technical note, DREG-TN-78-3 26P William D.

# UNCLASSIFIED REPORT

Electrical properties, Humidity, Electric discharges, Magnesium batteries, Circuit analysis, SUPPLEMENTARY NOTE: Abstract in French. See also Part 1, AD-A043 635. DESCRIPTORS: \*Sea water batteries, \*Sonobuoys, Lead compounds, Chlorides, Cathodes, Cells, Electrodes, Low temperature, Salinity,

deterioration in electrical performance was detected as a result of a ten day humid storage period. To achieve the goal of eight hours discharge it is hours of discharge for electrodes capable of meeting rigorous activation criteria in low temperature, salinity seawater. Cathodic efficciencies an eight hour sonobuoy battery application. Tests on ten-cell batteries resulted in only five to six that AIRI cathode be fabricated using The AIRI lead chloride cathode was evaluated for an expanded metal rather than a woven screen. between 75% and 95% were obtained and no recommended

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

DAYTON UNIV OHIO RESEARCH INST 10/3 AD-A054 857

Feasibility Study of Inorganic Oxides for Thermal Energy Storage Applications.

3

DESCRIPTIVE NOTE: Final rept. 15 Mar 76-30 Sep 77, Davison, Joseph E. ; NOV 77 87P DA REPT. NO. UDRI-TR-77-53 CONTRACT: F33615-76-C-2096

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FROJ: 3145 TASK: 19

TR-77-70 AFAPL MONITOR:

# UNCLASSIFIED REPORT

\*Thermal batteries, \*Energy storage, Thermophysical properties, Heat of fusion, Melting phases, Solid phases, Transformations, Eutectics, point, Phase diagrams, Binary compounds, Liquid Compatibility, Containers, Alloys, Aerospace \*Inorganic compounds, \*Oxides, DESCRIPTORS:

IDENTIFIERS: WUAFAPL31451960, PE62203F

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The University of Dayton conducted a feasibility study of the application of inorganic oxides as the best energy storage media for thermal energy storage devices. The thermophysical properties of the heat of fusion and the melting temperatures of the pure inorganic oxides were reviewed and evaluated. A total of nine inorganic oxides were identified which have a value for the heat of fusion greater than 793.7 Joules per gram (100 watt-hours per pound). However, all of Systems was limited to those systems which contain at temperature interval. The binary system comprised of dilithium oxide and diboron trioxide was assessed as having the highest potential. the melting points of these nine oxides are greater than 1570 C. Since none of these pure materials F), the phase diagrams of binary inorganic oxides were reviewed. The study of binary inorganic oxide had a melting point in the desired temperature interval of 538 C to 760 C (1000 F to 1400 least one of the nine pure oxides which have a liquid-solid transformation in the required

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

1/4 1/2 EIC CORP NEWTON MASS AD-A054 792

3 Basic Studies of the Lithium Secondary Electrode.

DESCRIPTIVE NOTE: Technical rept. no. 1, 01 Feb 77-31 Brummer, S. Barry ; Koch, Victor R. : Young, Jack H. ; 31P 78 Jan 78, MAR

C-480-1 N00014-77-C-0155 CONTRACT: REPT. NO.

# UNCLASSIFIED REPORT

Electrodes, Electrolytes, Lithium compounds, Oxides, Butyl radicals, Fluorides, Arsenic compounds, Polymers, Organic chemistry IDENTIFIERS: THF(Tetrahydrofuran), \*Lithium batteries, WUNR359638 \*Storage batteries, \*Lithium, DESCRIPTORS:

3 3

> inrespective of electrolyte purification procedure. In fact, highly purified media reacted most readily with Li presumably due to the absence of protective film-forming gases such as 02 and N2. Extended pre-electrolysis of LiClO4/THF electrolytes electrode, the reactions of tetrahydrofuran (THF) a brown film on Li. The brown film appears to be (Buoli), the enolate anion of acetaldehyde, and ethylene. The AsF6- anion is reduced by Li to AsF3 which further reacts with Buoli to form with Li have been evaluated. Tetrahydrofuran is reductively cleaved by Li to lithium n-butoxide As part of a basic study of the secondary Li Lif. These products were observed to form composed of an (-As-0-As-)n polymer and

formed large amounts of basic material, as expected. The same experiment performed on LiAsF6/THF electrolyte revealed essentially no change in the degradation effectively neutralize each other. A mechanism which accounts for Li-cyclic ether medium's pH. Apparentl,, the AsF3 from AsF6- and the basic material from THF reactivity is proposed. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH 10/2 AD-A054 619

3 Investigation of Charging Methods for Nickel-Cadmium Batteries,

Wagner, Otto C. ; Williams 4 b 74 Dorothy D.

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Nickel cadmium batteries, \*Battery chargers, Life cycles, Life expectancy, Anodes SUPPLEMENTARY NOTE: Presented at the Annual Proceedings Power Sources Conference (26th),

AD-A054 619

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ZOMO2

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

ARING RESEARCH CORP WASHINGTON D C AD-A054 444

Silver-Zinc Batteriss,

3

Coss, R. ; Denson, J. ; JUN 65 28P REPT. NO. 4630-523

# UNCLASSIFIED REPORT

equipment, Reserve batteries, Power supplies, Direct current, Silver oxides, Cathodes, Zinc, Porous materials, Anodes, Potassium compounds, Hydroxides, Distilled water, Maintenance, \*Silver zinc batteries, \*Aircraft Electrolytes DESCRIPTORS:

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 $\widehat{\Xi}$ Until about a decade ago, only lead-acid storage batteries were utilized as a reserve source of dc power for aircraft applications. However, technological advances in the alkaline family of batteries have introduced new electrochemical systems having significant advantages over the lead-acid derives its name from its active materials, silveroxide (AgO) for the positive electrode and porous zinc metal (Zn) for the negative electrode. The electrolyte is a liquid solution of potassium hydroxide (KOH) in distilled water. (Author) battery. One of these electrochemical systems is the silver-zinc battery. The silver-zinc battery

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

ESB INC YARDLEY PA ESB TECHNOLOGY CENTER 10/3 13/8 AD-A054 323

Production and Engineering Methods for Carb-Tek (trade name) Batteries in Fork Lift Trucks. Volume 3. Manufacturing Cost/ Plant Layout Estimate.

3

DESCRIPTIVE NOTE: Final rept. Nov 76-Nov 77, Schaefer, James C.; NOV 77 20P SCI REPT. NO. 0035-4-VOL-3 CONTRACT: DAAK02-75-C-0035

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 1, AD-A054 DESCRIPTORS: \*Production control, \*Industrial engineering, \*Electric batteries, \*Forklift vehicles, \*Cost estimates, Manufacturing, Industrial plants, Sodium chloride, Battery components, Power, Cells, Failure, Seals(Stoppers), Cathodes, Tellurium,

3

This report describes the technological development of the Carb-Tek (Trade name) Molten Salt pilot line operations are described and discussed. Significant failure mode is attributed to certain Li/Cl system toward prototype production for eventual assembly into-fork lift truck batteries. Engineering developments, cost reductions, and cell components. Seals are a problem. (Author)

3

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PAGE

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

FA054 322 13/8 10/3 13/6 ESB INC YARDLEY PA ESB TECHNOLOGY CENTER AD-A054 322

Production and Engineering Methods for Carb-Tek (trade name) Batteries in Fork Lift Trucks. Volume 2. Standard Operating Procedures.

3

DESCRIPTIVE NOTE: Final rept. Nov 76-Nov 77, NOV 77 140P Schaefer, James C. ; 0035-4-VDL-2 DAAK02-75-C-0035 REPT. NO.

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 3, AD-A054 DESCRIPTORS: \*Production control, \*Industrial engineering, \*Electric batteries, \*Forklift vehicles, Operational effectiveness, Standardization, Battery components, Sodium chloride, Tellurium compr.uds, Cathodes, Electrolytes, Seals(Stoppers), Cells, Graphite, Requirements, Fused salts

 $\widehat{\Xi}$ 

3 This report describes the technological development of the Carb-Tek(Trade Name) Molten Salt Li/Cl system toward prototype production for eventual assembly into fork lift truck batteries. pilot line operations are described and discussed. Significant failure mode is attributed to certain Engineering developments, cost reductions, and cell components. Seals are a problem. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

-A054 321 13/8 10/3 13/6 ESB INC YARDLEY PA ESB TECHNOLOGY CENTER AD-A054 321

Production and Engineering Methods for Carb-Tek (trade name) Batteries in Fork Lift Trucks. Volume 1. Technical.

3

DESCRIPTIVE NOTE: Final rept. Nov 76-Nov 77, NOV ?? 68P Schaefer, James C. ; DAAK02-75-C-0035 9035-4-VOL-1 CONTRACT: REPT. NO.

## UNCLASSIFIED REPORT

See also Volume 2, AD-A054 SUPPLEMENTARY NOTE:

requirements, Industrial plants, Power, Failure DESCRIPTORS: \*Production control, \*Industrial engineering, \*Electric batteries, \*Forklift vehicles. Cathodes, Battery components, Cells, Seals(Stoppers), Electrolytes, High temperature, Sodium chloride, Costs, Military Tellurium

3

3 developments, cost reductions, and pilot line operations are described and discussed. Significant failure mode is attributed to certain cell This report describes the technological development of the Carb-Tek Molten Salt Li/Cl system toward prototype production for eventual assembly into fork lift truck batteries. Engineering components. Seals are a problem. (Author)

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB AD-A053 925

New Solid Electrolytes

3

DESCRIPTIVE NOTE: Journal article,
JUL 76 17P Hong, Henry y-P.;
REPT. NO. MS-4178
CONTRACT: F19628~76-C-0002, ARPA Order-600 REPT. NO. CONTRACT: MONITOR: E

TR-78-5 ESD

# UNCLASSIFIED REPORT

Availability: Pub. in Solid State Chemistry of Energy Conversion and Storage, 17p 1977.

DESCRIPTORS: \*Solid electrolytes, \*Storage Crystallography IDENTIFIERS: Fastalkali-ion transport batteries, Reprints, Alkali metals,

This paper discusses several new solid electrolytes for fast alkali-ion transport in terms of the applicable crystallographic principles.

(Author)

3

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

RAYTHEON CO HUNTSVILLE ALA LIFE CYCLE ANALYSIS DEPT 14/4 16/4 10/3 AD-A053 410

Storage Reliability of Missile Materiel Program, Missile Systems Battery Analysis.

3

DESCRIPTIVE NOTE: Final rept. Jun 74-Jan 78, FEB 78 58P Mitchell, Joe C.; REPT. NO. LC-78-B1 CONTRACT: DAAK40-74-C-0853

# UNCLASSIFIED REPORT

batteries, \*Guided missile components, \*Reliability, \*Storage, Long range(Time), Shelf life, Field tests, Data acquisition, Sampling, Inventory control, Guided missile batteries, Packaging, Temperature, Aging(Materials) DESCRIPTORS: \*Silver zinc batteries, \*Thermal

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3

This report documents findings on the non-operating reliability of silver zinc and thermal batteries. Field data and shelf life data is included. This information is part of a research program being conducted by the U. S. Army Missile R and D Command, Redstone Arsenal, Alabama.

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(Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

7/2 FIC CORP NEWTON MASS AD-A053 378

Lithium - Inorganic Electrolyte Batteries.

MAR 78 86P Driscoll, Joseph R.; Brummer, S. Barry; Gudrais, Peter; Holleck, Gerhard L.; DESCRIPTIVE NOTE: Final rept. 17 Sep 73-30 Sep 77,

Toland, David E. ;

CONTRACT: DAAB07-74-C-0030 1L162705AH94

ECOM 74-0030-F MONITOR:

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Storage batteries, \*Lithium chlorine cells, \*Inorganic materials, \*Electrolytes, Anodes(Electrolytic cell), Calcium, Lithium alloys, Ultraviolet spectrophotometers, Plating, Infrared spectrophotometers, Stoichiometry, Thionyl chloride

DENTIFIERS: ASH94, PE62705A, WU216

33

can be written, the one most closely corresponding to the data is: 4Li + 2SOC12 yields 4LiC1 the reaction stoichiometry of the cell discharge via chemical analysis of the reaction products; we have also investigated the problem of Li/SOC12 cell passivation during storage at 7: C (160 F), with a particular view to finding practical solutions. Analytical measurements were carried out on complete Li/SOC12 cells. Qualitative tests identified three discharge products, LiCl, S and SO2. Quantitative analyses were performed for these species. Of the several stoichiometries that battery system. The work on this program has centered along two lines: We have investigated + S + SO2. The analytical data for LiCl and S correspond to this reaction. The SO2 is, 1977. This report summarizes our research and development effort on the Li/thionyl chloride DAABO7-74-C-0030. It contains the results of work for the period September 1973-September This is the Final Report on ECOM Contract

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL WEAPONS CENTER CHINA LAKE CALIF 10/3

Differential Scanning Calorimetry Studies of Some Electrolyte Systems Pertinent to Thermal Batteries.

3

Fine, Dwight A. ; Fletcher, DESCRIPTIVE NOTE: Research rept. Nov 76-Aug 77, 26P FEB 78

Aaron N. ;

REPT. NO. NWC-TP-6014 PROJ: F61112, F54595 TASK: ZF61112001, ZF54595003

E101-0400 MONITOR: GIDEP

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Thermal batteries, \*Electrolytes, \*Anodes(Electrolytic cell), \*Calcium,
\*Electrochemistry, Scanning, Calorimetry,
Calcium oxides, Nitrates, Thiocyanates, Acids, Alkali metal compounds, Halides
DENTIFIERS: Lux-Flood acids, Differential
scanning calorimeters, PE62766N, PE62761N,
PE61152N, PNZR01305 IDENTIFIERS:

3

3 which are potentially useful in thermal batteries has been investigated by differential scanning oxide is formed on the metal in molten nitrates; this layer can be broken down in a controllable manner by the addition of Lux-Flood acids or alkali halides has been found that a passivating layer of calcium molten nitrates and thiocyanates has been studied. The thermal behavior of some electrolyte systems calorimetry. The reactivity of calcium metal in The nitrate systems are the most promising. It to the nitrates. (Author)

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AD-A053 378

however, twice the value predicted by this reaction.

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A050 342 10/3
PENNSYLVANIA UNIV PHILADELPHIA DEPT OF METALLURGY AND MATERIALS SCIENCE

High Energy-Density Electrodes for Alkali-Metal Battery Systems. (U)

DESCRIPTIVE NOTE: rinal rept. 1 Apr-31 Jul 77, NOV 77 26P Worrell, wayne L. :Basu, Samar ;Nagelberg, Alan ; CONTRACT: AFOSR-77-3319, ARPA Order-3019 MONITOR: AFOSR TR-78-0053

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Alkaline batteries, \*Electrodes, High energy, High density, Lithium compounds, Tantalum compounds, Sodium compounds, Sulfides, Chalcogens, Transition metals, Formulations(Chemistry), Electrochemistry, Thermodynamics, Diffusivity
IDENTIFIERS: PE61101E

33

One major impedirent in the development of new alkali-metal battery systems with high energy density is the lack of suitable electrode materials. Dichalcogenides of the Group IV and V transition metals intercalated with lithium or sodium offer exciting possibilities as novel high energy—density electrodes. (U)

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7 - AD-A049 445 10/3

NAVAL WEAPONS SUPPORT CENTER CRANE IND WEAPONS QUALITY ENGINEERING CENTER

Engineering Evaluation Tests of 3-4 Ampere— Hour Sealed Lead-Acid Batteries Elpower, ESB, Eagle-Pitcher, Globe Union and Gates,

3

DEC 77 15P Goodman, A. W. REPT. NO. WQEC/C-77-395

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Lead acid batteries, Quality assurance, Acceptability, Life cycle testing, Electric charge, Electric discharges, High rate, Low temperature, Heavy duty, Thermal cycling tests

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The program objective was to evaluate and determine: High rate capability, Low temperature performance, A plot of discharge time versus various discharge rates, Life cycle capability, and Charging requirements.

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

STANFORD UNIV CALIF CENTER FOR MATERIALS RESEARCH

Solid Electrolyte Battery Materials.

3

DESCRIPTIVE NOTE: Final rept. 1 Jul 76-31 Sep 77, NOV 77 15P Huggins, Robert A.; REPT. NO. CMR-77-15 CONTRACT: NO0014-76-C-0940

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Solid electrolytes, \*Lithium compounds, \*Nitrides, Ions, Ionic current, Crystal structure, Polycrystalline, Electric batteries, Transport properties
IDENTIFIERS: WUNR359621

33

3 given to lithium ionic conductors. Crystal structure information was obtained, and measurements made of ionic conductivity and other relevant number of other potential ionic conductors and mixed This is the final report on this contract. Work involved the preparation of lithium nitride and a ionic-electronic conductors. Most attention was properties. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

J-A047 925 9/2 10/2 JET PROPULSION LAB PASADENA CALIF AD-A047 925

Computer Program for Design and Performance Analysis of Navigation-Aid Power Systems. Program Documentation, Volume I. Software Requirements Document.

3

REPT. NO. JPL-5040-27-Vol-1 MONITOR: USCG,CGR/DC D-11-77-VOL-1,18/76-VOL-DESCRIPTIVE NOTE: Final rept.,
JUL 77 182P Goltz,G.;Kaiser,L. M.
Weiner,H.;

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Computer program documentation, \*Power supplies, \*Solar cells, \*Electric batteries, \*Computer aided design, Feasibility studies, Life See also Volume 2, AD-A047 expectancy, Cost effectiveness, Flow charting, Algorithms, Test and evaluation SUPPLEMENTARY NOTE:

3

the program, and defines the necessary interfaces for and analyzing the performance of solar array/battery power systems for the U.S. Coast Guard Navigational Aids. This program is called the Design Synthesis/Performance Analysis (DSPA) Computer Program. The basic function of the Design Synthesis portion of the DSPA Program is to evaluate functional and economic program, discusses the processing that occurs within program is to simulate the operation of solar array/ battery power systems under specific loads and environmental conditions. This document establishes A computer program has been developed for designing criteria to provide specifications for viable solar array/battery power systems. The basic function of the software requirements for the DSPA computer the Performance Analysis portion of the DSPA

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. 20MO7

10/3 20/5 19/5 19/5 RCA GOVERNMENT AND COMMERCIAL SYSTEMS BURLINGTON MASS AUTOMATED SYSTEMS DIV AD-A047 881

Battery Charger PP-7286 ( )/U.

3

DESCRIPTIVE NOTE: Final rept. Jul 76-Jun 77, B2P Woodward, J. ; Waldstein, S. DEC 77 82P WOO CONTRACT: DAABO7-74-C-0270

1E764723DL71

MONITOR: ECOM 74-0270-F

# UNCLASSIFIED REPORT

33 ESCRIPTORS: \*Battery chargers, \*Nickel cadmium batteries, \*Lasers, \*Range finding, Army equipment, Electromagnetic interference, Electrical properties IDENTIFIERS: PE64723A, ASL71 DESCRIPTORS:

developed to support the Laser Rangefinder MX-9838 ()/GVS-5 which is powered by a rechargeable nickel cadmium battery, type BB-516 ()/U and other wing equipment using qenerically similar batteries. The technical characteristics are described in ECOM Development Specification Number EL-CP2128-0001A. The hardware developed consisted of the Battery Charger PP-7286 ( )/U and its Transit Case CY-7670 ( )/U. The Battery The Battery Charger PP-7286 ( )/U was

can be set in tenths of an hour increments from 0.1 to 19.1 hours. Time remaining in the charging cycle is displayed by an incandescent, seven segment, 3 digit display. An internal primary battery provides nonvolatile memory for the charger in the event of milliamperes inclusive. A multiple scale meter can be switched to measure current in each of the five Charger operates from prime power of 115 or 230 V (plus or minus 10%) 47 to 63 Hz ac. It channels. The circuits provide constant current into any load from zero volts (short circuit) to provides five independently adjustable charging circuits, each capable of being set to charge at constant current rates from 15 through 700 36 volts. A digita! timer common to all circuits power interruption.

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

--A047 787 9/1 10/3 11/6 DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) AD-A047 787

A Porous Zinc Electrode for Use at Very Low Temperatures,

3

Armstrong, William A. ; 24P Powell, Peter J. ; REPT. NO. DRED-765 NOV 77

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Electrodes, \*Zinc, \*Porous materials, \*Low temperature batteries, Electric discharges, Primary batteries, Reserve batteries, Air flow, Beacons, Power supplies, Cells, Stacking, Corvection, Dendritic structure, Plating, Baths, Current density, Canada IDENTIFIERS: AN/TRN-30 SUPPLEMENTARY NOTE: Summary in French.

33

3 The structure of porous electrodes made from pressed dendritic zinc has been varied to improve the deposition of dendritic Zinc were investigated as was the use of different binders and current temperature discharges. The effects of varying the composition of the plating bath and the rate of efficiencies of zinc utilization during low

AD-A047 787

ZOMO2

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NAVAL UNDERSEA CENTER SAN DIEGO CALIF 10/3 AD-A047 658

3 Development of Lithium Inorganic Electrolyte Batteries for Navy Applications.

DESCRIPTIVE NOTE: Research and development rept. Jul 74-McCartney, J. F.; Shipman, W. H. ; Gunderson, C. R. ; Koehler, C. W. ; REPT. NO. NUC-TP-564 FEB 77 106P

# UNCLASSIFIED REPORT

Anodes(Electrolytic cell), Lithium compounds, Aluminum compounds, Chlorides, Low temperature batteries, Propulsion systems, Underwater propulsion, Naval planning, Naval equipment, Performance(Engineering) DESCRIPTORS: \*Storage batteries, \*Lithium, \*Thionyl chloride, Electrolytes, Carbon, Cathodes(Electrolytic cell),

 $\widehat{\Xi}$ understood, lithium-thionyl chloride cells and batteries can be developed for a variety of high- and completed an extensive test program of lithium-thionyl chloride (SOC12 cells of both the high-rate As a result of this program, the improved cells are now being used, with complete success, in numerous and low-rate configurations. Several deficiencies of earlier cells were corrected by modifying cell additives to the electrolyte for improved safety. ocean-oriented applications. Now that many of the low-rate applications involving both large- and problems and hazards of these cells are better hardware design and the addition of chemical The Naval Undersea Center (NUC) has small-size cells. (Author)

### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MD7

7/4 UTAH UNIV SALT LAKE CITY 19/4 AD-A046 641

Theoretical and Experimental Investigation of Reaction Mechanisms of Explosives, Corrosion, and Battery and Fuel Technology.

3

DESCRIPTIVE NOTE: Final rept. 1 Sep 74-31 Aug 77, OCT 77 31P Eyring, Henry ; Kelley, Robert

CONTRACT: DAHC04-75-G-0019 MONITOR: ARD 12367.1-C

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Detonations, \*Corrosion, \*Fuel cells, Reports, Electrodes, Carbon, Oxygen, Polymers, Porphyrins, Catalysts, Oxidation reduction reactions, Synthesis(Chemistry), Reaction kinetics, Mathematical models, Equations of state, Storage batteries, Specific heat IDENTIFIERS: Porphyrazines

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3 Porphyrazines for study as oxygen reduction catalysts but highly accurate model of detonation which ignores viscosity, diffusion, and heat conduction. The reaction, kinetics with starvation, balance laws, and polymer carbon electrodes to serve as oxygen electrodes and on the synthesis of porphyrins and in conjunction with polymer carbon electrodes are described. The report also presents a very simple Research efforts on the formation and analysis of salient features of the model are unimolecular a covolume equation of state. (Author)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

PENNSYLVANIA UNIV PHILADELPHIA DEPT OF CHEMICAL AND BIOCHEMICAL ENGINEERING AD-A045 953

Lithium Sulfuryl Chloride Battery.

3

Nanis, Leonard ; Kapur, Vijay DESCRIPTIVE NOTE: Final rept. 1 Dec 74-30 Nov 75, K. ;Gencer,Mehmet Ali ; CONTRACT: DAABO7-75-C-1676 PROJ: 15762705AH94 17P

MONITOR: ECOM 75-1676-F

### UNCLASSIEIED REPORT

DESCRIPTORS: \*Lithium chlorine cells, \*Sulfur compounds, \*Aluminum compounds, \*Electrical conductivity, Nonaqueous electrolytes, Electrodes, Solvents, Calibration, Circuits, Measuring instruments, Battery components, Current density, Constants, Frequency, Experimental data, Concentration(Chemistry), Dielectric properti DENTIFIERS: PE62705A, ASH94, PU215

maximum conductivity. Accordingly, work on this project was directed towards obtaining conductivity data for a practical range of concentrations of LiAIC14 (0.1-1.0M) dissolved in SO2C12.

In order to obtain data rapidly, a novel procedure large to avoid internal resistive losses during current passage. Since the maximum current which may be drawn from a cell is resistance limited, the conductivity of electrolyte becomes an important parameter for optimum cell design. As is well known, the concentration of electrolyte in several types of aqueous batteries is chosen primarily for which included a large frequency effect associated with the low dielectric constant of S02C12. conductivity probe was developed to supplement the relatively simple equipment. A four-point dipping The conductance of battery electrolyte should be two-point method (described in ECOM75-1676-1) was devised which yielded good results with

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

AD-A045 620 10/3 FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY COLO

The Discharge Behavior of a LiAl/ NaAlCI4/CuCl2 Pelletized Thermal Ce 11.

3

DESCRIPTIVE NOTE: Technical rept. Jan 76-Feb 77, FEB 77 62P Erbacher, John K. ;Hussey, Charles L. ;King, Lowell A. ; REPT. NO. FJSRL-TR-77-0001

TASK: F2, 02

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Thermal batteries, \*Electrochemistry, discharges, Electrodes, Pellets IDENTIFIERS: Lithium aluminides, Sodium aluminum chlorides, Copper chlorides, PE61102F, WUFJSRL2303F207, WUFJSRL79030207 Lithium, Lithium compounds, Aluminum compounds, Sodium compounds, Copper compounds, Chlorides, Graphite, Particle size, Current density, \*Electrolytes, \*Anodes(Electrolytic cell), \*Cathodes(Electrolytic cell), Aluminum, Temperature, Electric current, Electric

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Pelletized thermal battery single cell experiments tetrachloroaluminate/copper (II) chloride electrochemical system are described. The effects of copper (II) chloride particle size, brand of graphite in the cathode, variation of the Li content of the alloy anodes, current density, and discharge conditions are discussed. A mechanism discharge temperature under constant current for the reaction of LiAl alloys in the on the lithium-aluminum alloy/sodium NaAlCI4 electrolyte is proposed.

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# UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY COLO AD-A045 339

Extended Abstracts of the Biennial Air Force Electrochemistry Conference (4th).

 $\widehat{\Xi}$ 

Hussey, Charles L. : King, DESCRIPTIVE NOTE: Technical rept., 59P ¥. Lowell

FJSRL-TR-77-0013 REPT. NO. PROJ: 23 TASK: F2

2303

## UNCLASSIFIED REPORT

33 DESCRIPTORS: \*Electrochemistry, \*Electric batteries, Conferences, Reports, Abstracts, Nickel cadmium batteries, Hydrogen, Zinc compounds, Silver compounds, Fuel cells, Catalysts, Electrolytes, Lithium compounds, Therma' batteries, Aluminum compounds, Chlorides, Fused salts
IDENTIFIERS: PE61102F, WUFJSRL2303F206

Abstracts of presentations given at the 4th Biennial Air Force Electrochemistry Conference, 28-29 April 1977, are Compiled. (Author)

#### UNCLASSIFIED

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

10/3 HANTELLE COLUMBUS LABS OHIO AD-A044 888

A Survey of the Use of Ceramics in Battery and Fuel Cell Applications.

3

Brooman, Eric W. ; Shillito, DESCRIPTIVE NOTE: Fina! rept. Jan-Jun 77, Keith R.; Boyd, Walter K.; CONTRACT: DAAG46-77-M-0460 87P JUN 77

CTR-77-18 PROJ: 17162105AH84 AMMRC MONITOR:

## UNCLASSIFIED REPORT

Thermal batteries, Surveys, Low temperature, High temperature, Primary batteries, Storage batteries, \*Fuel cells, Solid electrolytes, \*Ceramic materials, \*Electric DESCRIPTORS:

batteries, Battery Components IDENTIFIERS: LPN-DA-DE-4741, ASH84, PE62105A

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ceramics in battery and fuel cell applications.
Brief descriptions and characteristics of batteries are presented, including those operating at near ambient and at elevated temperatures. The current technology of fuel cells is also discussed.
Finally, a detailed analysis of the problem areas A survey has been carried out examining the use of and related research needs for ceramics in these applications is provided together with recommendations for future work in this area.

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(Author)

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AD-A044 315 10/3 7/4 DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

Evaluation of a Reserve-Primary Zinc/Air Battery to Power the  $\mathrm{AN/TRN-30}$  Beacon.

 $\Xi$ 

Armstrong, William A. ; Moroz, DESCRIPTIVE NOTE: Technical note, DREO-TN-77-17 391 11 Walter J. AUG

## UNCLASSIFIED REPORT

Separators, Disintegration, French language, Low DESCRIPTORS: \*Primary batteries, Air, Zinc, Canada, Electrolytes, Leakage(Fluid), SUPPLEMENTARY NOTE: Abstract in French. DENTIFIERS: AN/TRN-30 temperature

3 Despite problems with leakage of electrolyte, disintegration of the separator material and air starvation at the cathodes, batteries gave four hours of discharge at 34, while maintaining the battery voltage between 20-30V at temperatures between -40 and 49 C. Suggestions were made for improvements in the battery design. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMD7

FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY COLD AD-A043 659

High Energy Density Pelletized Aluminum Chloride Thermal Batteries: Part II. Cathode Screening.

3

Nardi, John C. ; Erbacher, DESCRIPTIVE NOTE: Technical rept. Jan 76-Apr 77 316

John K. ; Hussey, Charles L. ; REPT. NO. FJSRL-TR-77-0004 PROJ: 2303 TASK: F2

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Thermal batteries, \*Primary batteries, \*Cathodes(Electrolytic cell), Anodes(Electrolytic cell), Battery components, SUPPLEMENTARY NOTE: See also AD-A021 748. High energy

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available energy density, and high voltages under load. Various brands of graphite, acetylene black, and various types of metallic current collectors also Pelletized single cell experiments have been conducted to develop a family of potential cathode for a new, low temperature thermal battery system. The cells utilize a 60.2 a/o lithium-aluminum alloy anode and a molten salt electrolyte of NaC1-satureted ACG3. They operate at temperatures between 175 and 250 C. A total of 40 sulfides, oxides, and halides were evaluated and compared to the molybdenum (V) chloride and copper (II) chloride cathodes previously studied. Of this group, three halides, WC16, FeC13, and TeC14, exhibited long discharge lifetimes, high were evaluated for performance enhancement.

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AD-A043 659

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) AD-A043 635

The AIRI Fusion Cast Lead Chloride Electrode. Part I. Preliminary Evaluation of Suitability as Cathode in Sonobuoy Batteries.

DESCRIPTIVE NOTE: Technical note, JUL 77 35P Donaldson, George J. REPT. NO. DREG-TN-77-16-Pt-1 Coleman, John R. ;

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Abstract in French.
DESCRIPTORS: \*Sea water batteries, \*Lead compounds, \*Chlorides, \*Cathodes(Electrolytic cell), \*AN/ Performance (Engineering), Foreign technology, SSQ-517, Sonobuoys, Electrodes,

Canada IDENTIFIERS: Lead chlor de

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sonobuoy battery applications. The material is capable of providing electrical performance in excess of the specifications given for a nominal three hour sonobuoy battery. Rapid activation can be achieved chloride deposit is sufficiently uniform and light so that the copper gauze electronic conductor remains exposed at the electrode surface. The pulse discharge performance has been briefly examined and discharge without excessive voltage loss. Further evaluation remains to be done both on the passive and produced by the AIRI process has been subjected to a preliminary examination to test its suitability in the material appears to be capable of pulsed current by selecting cathode material in which the lead The fusion-cast flexible lead chloride material active sonobuoy battery applications for this electrode. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

HONEYWELL INC HORSHAM PA POWER SOURCES CENTER 10/3 AD-A043 364

Lithium Inorganic Electrolyte Battery Investigation.

3

DESCRIPTIVE NOTE: Final rept. 9 Sep 74-31 Jan 77, APR 77 168P Chua, D. L. ; Walk, C. R. ; CONTRACT: F33615-74-C-2071

PROJ: 3145 TASK: 22

3

MONITOR: AFAPL

## UNCLASSIFIED REPORT

3 3 SUPPLEMENTARY NOTE: Original contains color plates: All DDC reproductions will be in black and white. DESCRIPTORS: \*Primary batteries, Lithium compounds, Lithium chloride, Passivity, Battery components, Lithium chlorine cells IDENTIFIERS: Lithium batteries, Lithium Thionylchloride Batteries, \*Lithium Chloride Batteries, PE62203F, WUAFAPL31452268

The problem of passivation during storage was investigated and additions of 5 weight percent sulfur dioxide was found beneficial in reducing the effects of passivation. Some preliminary capacity retention and safety data were generated. Three sizes of cells, (1.6, 165, and 350 ampere hours) were fabricated and tested. Performance was 130 watt hours/ib and 11.8 watt hours/cu in. for the 1.6 Ah cells. The large 531 ampere hour cells delivered information was generated on the nature of the film investigated for three potential applications and their performance measured under simulated loads. formed on the lithium electrode during storage. Lithium Thionyl Chloride Batteries were over 280 Wh/lb and 19 Wh/cu in. Some (Author)

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SEARCH CONTROL NO. ZOMO? DDC REPORT BIBLIDGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

On the Possibilities of Using Titanium as a Source of Energy in Rechargeable Batteries,

3

Klochko, Mikhail A. ; Casey, OREG-R-759 77 47P Edmund J. ;

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Storage batteries, Electric power, Titanium, Battery chargers, Sources, Electrolytes, Lightweight, High energy, Canad IDENTIFIERS: \*Titanium batteries SUPPLEMENTARY NOTE: Abstract in French.

33

3 halogens. After a review of the occurrence and technology of titanium, the history of its studies in on the choice of materials for anodes, cathodes and electrolytes for Ii batteries are presented and several electrochemical reactions on which these batteries are based are offered. (Author) not been utilized as a reactant or energy-supplying material in batteries, despite its advantageous electrochemical behaviour in aqueous and nonaqueous litanium has become available as a commercial metal properties -- its low weight-density and the high only since World War II. and, at low price, a decade later. This explains the fact that Ti has and molten salt media is discussed. Suggestions energy-density of its reaction with oxygen and the USA and in the U.S.S.R., its

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMOT DOC REPORT BIBLIDGRAPHY

13/2 VERSAR INC SPRINGFIELD VA AD-A042 802

3 Investigation of the Environmental Consequences of Disposal of the Lithium-Organic Electrolyte/SO2 Battery.

DESCRIPTIVE NOTE: Research and development technical rept. Slimak, M. ; Freed, J. ; Kennedy, K. ; Juergens, E. ; McCandless, L. ; Sep 76-Mar 77 on Phase 1,

DAAB07-76-C-1752 ECOM 76-1752-1 CONTRACT: DAAE MONITOR:

## UNCLASSIFIED REPORT

Cyanides, Ponds, Leaching, Environmental impact statements, Pollution, Pollutants
IDENTIFIERS: Soil shake tests, Landfills, LPN-PRON-08-6-04586-01-C9-CA \*Carbon, \*Waste disposal, Lithium compounds, Bromides, Sulfur oxídes, Acetonitrile, Solutions(Mixtures), Solid wastes, Toxicity, DESCRIPTORS: \*Primary batteries, \*Lithium,

3 3

3 upon a literature review for toxicity of the battery cross-sectioned batteries. The leaching tests identified significant quantities of cyanide from discharged batteries. (Author) This report contains preliminary recommendations for the disposal of small and large quantities of components and laboratory tests of leachate from lithium-organic electrolyte/502 batteries based

AD-A042 802

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

MALLORY BATTERY CO TARRYTOWN N Y 4D-A042 799

Primary Lithium Organic Electrolyte Battery BA - 5598 ( )/U.

3

DESCRIPTIVE NOTE: Final rept. 1 Dec 72-Apr 76, Kravetz, S. ; Raman, N. ; 77 59F Kre DAAB07-72-C-0288 CONTRACT: DAA

PROJ: 1L7637020G10 TASK: 01

MONITON: ECOM 72-0288-F

### UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Primary batteries, \*Organic materials, Anodes(Electrolytic cell), Carbon, Cathodes(Electrolytic cell), High temperature, Hermetic seals, Storage, Specifications, Electric current Lithium, Electrolytes, Sulfur oxides, Temperature, Low temperature,

3 IDENTIFIERS: Lithium batteries, WU213, ASG10,

PE63702A

cell to replace the original compression sealed cell. at developing a Primary Lithium Organic Electrolyte Battery capable of operating over a temperature range of -40 F. to 125 F. A 15.0 volt battery, was designed with hermetically sealed cells to withstand high temperature storage conditions and to operate simulated field equipment This report summarizes the program which was aimed pulse loads. The cells are designed for energy densities up to 150 WH/LB at room temperatures at modified to incorporate a new hermetically sealed In addition to preventing leakage of SO2 during storage at 160 F., the cell design self venting configuration was modified in order to meet the Technical Requirements of the BA - 5598 ( mechanism enhanced the safety characteristics approximately 0.4A drains. The contract was weight to as much as 50% as compared to the original BA - 584 ( )/U Battery. )/U Battery, which was reduced in size and associated with Lithiu Organic Primary Batteries. The battery nomenclature and

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

EUREKA ADVANCE SCIENCE CORP BLOOMINGTON ILL 10/3 AD-A042 558

High Energy Density Pelletized Aluminum Chlorine Thermal Batteries.

3

Ryan, David M. ; Bricker, L. DESCRIPTIVE NOTE: Final rept. 15 May-15 Dec 76, APR 77 115P

CONTRACT: F33615-76-C-2080

PROJ: 3145 TASK: 22

TR-77-12 MONITOR: AFAPL

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Thermal batteries, Aluminum compounds, Chlorides, High energy, Primary batteries, Pellets, Lithium alloys, Configurations, DESCRIPTORS:

Feasibility studies IDENTIFIERS: WUAFAPL31452271, PE62203F

33

Advance Science Corporation was undertaken to develop a profile of the operating characteristics of a battery utilizing this cell, and to investigate the entered into a contract to engineer the development of a thermal battery based upon an electrochemical Research Laboratory. This cell utilizes aluminum or lithium-aluminum alloy as its anode, a Cab-O-Sil/NaAlCl4 mixture as anolyte, and a mixture of anolyte, MoCl5 and graphite as cathode. Engineering research at the Eureka be unsuitable for cell preparation. The synthesis of NaAlC14 was carried out at FUSRL and at Eureka, and both synthesized materials were found catholyte. Lithium-aluminum alloys of 20 w/o Li and 28 w/o Li were investigated, and both were satisfactory for the production of anolyte and feasibility of manufacturing such a battery. Commercially available NaAIC14 was found to The Eureka Advance Science Corporation

AD-A042 558

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found to be suitable anode materials.

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PAGE

UNCLASSIFIED

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DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AD-A042 541 10/3 OFFICE OF NAVAL RESEARCH LONDON (ENGLAND)

Temperature Battery for Automobile Propulsion European Developments in the Na/S High and Energy Storage,

3

Sosin, Abraham ; JUN 77 11P REPT. NO. ONRL-R-5-77

## UNCLASSIFIED REPORT

\*Sulfur, \*Foreign technology, \*Thermal batteries, fround vehicles, Propulsion systems, Alumina, Ions, Transport properties, Electrodes, Solid electrolytes, Research management, France, Great Britain, West Germany DENTIFIERS: Sodium sulfur batteries DESCRIPTORS:

33

3 the operation of the battery, with indication of some considerations which control its development into an important technological system. The status of the battery development in England, France and for future use in the propulsion of automobiles, vans, buses, and trains and for energy storage and load-leveling by electrical utilities. This report presents a brief description of the fundamentals of The sodium-sulfur battiry is a leading candidate Germany is then reviewed. (Author)

#### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

Lithium Battery Systems: Examination of the lodine Pentoxide Cathode,

3

Coleman, John R. ; Nagy, Gerard D. ; PT. NO. DREO-R-760 29P JUN 77 REPT. NO.

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Alkaline batteries, \*Lithium compounds, \*Electrolytes, \*Cathodes, \*Iodine compounds, Oxides, Graphite, Potassium, SUPPLEMENTARY NOTE: Abstract in French. Perchlorates, Canada

3

3 Pentoxide, attractive because of its high theoretical graphite and pressed on an expanded silver grid served as cathode; the anodes were made by pressing electrolyte a variety of saits dissolved in polar organic solvents. Iodine pentoxide blended with energy density, was investigated, employing as lithium ribbon onto an expanded nickel grid. The electrochemical system lithium-iodine

PAGE

AD-A041 739

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

NAVAL SURFACE WEAPONS CENTER WHITE DAK LAB SILVER SPRING AD-A040 976

3 The Cause of Explosions in Old Mk 102 Mod 0 Batteries under Discharge.

DESCRIPTIVE NOTE: Technical rept., APR 77 17P Devries,L. REPT. NO. NSWC/WOL/TR-76-159

## UNCLASSIFIED REPORT

batteries, Zinc, Mercury compounds, Oxides, Explosions, Electric discharges IDENTIFIERS: Mark-102 Mod-0 batteries \*Alkaline batteries, \*Mercury DESCRIPTORS:

 $\widehat{\Xi}$ Two Mk 102 Mod 0 batteries exploded during dischange. An investigation indicated that the batteries had dead cell: prior to discharge. The cells in the battery are alkaline zinc-mercuric oxide recommended that the battery not be discharged when the open circuit voltage reaches 39.2v or below cells. Discharging this type of battery containing a dead cell can cause the cell to explore. It is (indicating a dead cell). (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

STANFORD UNIV CALIF CENTER FOR MATERIALS RESEARCH 10/2 AD-A039 899

3

DESCRIPTIVE NOTE: Technical rept., NOV 74 145P Huggins, Robert A. REPT. NO. CMR-74-16, TR-3 Solid Electrolyte Battery Materials. NOV 74 145P HUGGINS, REPT. NO. CMR-74-16, TR-3 CONTRACT: NO0014-67-A-0112-0075

## UNCLASSIFIED REPORT

\*Storage batteries, \*Electrolytes, \*Electrodes, Sodium, Lithium, Potassium, Ions, DESCRIPTORS: Sulfur

DENTIFIERS: \*Sodium sulfur cells, Solid electrolyte, WUNRO56555 IDENTIFIERS:

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3 3

> for producing beta alumina solid electrolytes for use in the sodium-sulfur cell. The other is to search for new fast ion conducting materials for lithium and potassium ions, as well as to examine mixed conductor materials for potential application as electrodes in present report covers the first six months of effort advanced secondary battery designs. The details and results of our efforts for the first year are presented in Technical Report No. 2. The This is the third technical report relating to work on Solid Electrolyte Battery Materials.
>
> During the past 18 months our efforts have had two major aims: one is to develop a novel technique in the second year.

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AD-A039 899

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) AD-4039 735

Nickel/Cadmium Aircraft Batteries: Multichannel Gassing-Rate Meter.

3

DESCRIPTIVE NOTE: Technical note, MAR 77 24F Feldman, Keiva; Haines, Ronald REPT. NO. DREG-TN-77-5

## UNCLASSIFIED REPORT

\*Nickel cadmium batteries, \*Storage Canada DENTIFIERS: Aircraft batteries, \*Gassing rate batteries, \*Battery separators, Manometers, Aircraft equipment, Multichannel, Filters, DESCRIPTORS:

3 meters

3 service of those cells which may be expected to fail catastrophically in the near future. Twenty state of health of separators in nickel/cadmium mircraft batteries and thus to permit removal from Each channel measures the rate of emission of gas from one cell during overcharge by means of the pressure build up in a chamber from which the gas escapes via a suitable orifice. Construction, observation of all cells in a complete battery. The instrument described is used to assess the channels are provided to permit simultaneous calibration and cleaning are discussed.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMOT DOC REPORT BIBLIOGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO AD-A039 521

Nickel/Cadmium Aircraft Batteries Battery Alarm Unit.

3

DESCRIPTIVE NOTE: Technical note, APR 77 18P Feldman, K.; Hayashi, R. M.

REPT. NO. DREG-TN-77-7

### UNCLASSIFIED REPORT

systems, Canada, Cells IDENTIFIERS: \*Aircraft batteries, \*Battery alarm DESCRIPTORS: \*Nickel cadmium batteries, \*Storage batteries, Aircraft equipment, Warning systems, Voltage, Short circuits, Failure(Electronics), Thermal properties, Low costs, Early warning SUPPLEMENTARY NOTE: Abstract in French.

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units, Thermal runway

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> precise sensitivity may be varied by varying resistor voltage of a single failing cell, Early detection of this decrease can provide time for suitable measures to be taken before other cells are damaged and catastrophic consequences occur. Also detection during battery shop operations can facilitate the screening out of defective cells. The battery alarm unit described in this paper was developed at DREO and is a simple device which monitors the cell voltages by comparing the voltage in one half of the battery with that of the other half. Only three connections to the battery are Malfunctions in nickel/cadmium aircraft batteries which may lead to dangerous thermal problems are required. Atypical voltage changes in a single cell, of the order of 50 mV may be detected. The values in the input network. The instrument has

AD-A039 521

and for attracting attention to cells which show low

capacity while being discharged. Presumably the

instrument could be equally useful as an early warning device on aircraft. For such applications consideration must be given to questions of procedure, configuration and airworthy mechanical

warning of failing cells in batteries being charged

been found useful in the battery shop both for

UNCLASSIFIED

ZOMO2

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Sealed Lithium Inorganic Electrolyte

Marincic, N. ; Lombardi, A. ; DESCRIPTIVE NOTE: Final rept. Mar 74-Oct 76, APR 77 216P Mar CONTRACT: DAABO7-74-C-0108 PROJ: 1S762705AH94

ECOM 74-0108-F MONITOR:

## UNCLASSIFIED REPORT

batteries, Electrolytes, Lithium alloys, Inorganic compounds, Thionyl chloride, Aluminum compounds, \*Electrolytic cells, \*Primary Gas generating systems, Sealed systems, DESCRIPTORS:

3

3 DENTIFIERS: \*Inorganic batteries, \*Lithium batteries, \*ASH94, wu213, PE62705A

subassemblies intended for use in wound electrode structures, i.e. the cells designed for a high rate of discharge, although the Laboratories' models and the low rate cells were used on occasions as the test vehicles in the evaluation of performance parameters characteristics of the system, followed by the design, testing and evaluation of finished, sealed D size cells. The rate capability of the cell was Most of the work was done with the components or this electrochemical system. The report is arranged chronologically, presenting the

3 established, along with the side effects of discharge at extreme rates such as the thermal runaway, gassing were developed and tested, preventing the discharge at excessive rates (fuses) or opening the cell to computer aided design and optimization of electrode the end of discharge, etc. Protective devices exceeding the energy density of 500 Wh/kg and 17 critical pressure and temperature that leads to structures, enabling the construction of D cell explosion. The procedures were developed for a the atmosphere (venting) before it reaches

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required for the above operation from a week or more

to a day or two. (Author)

mixing the added with the retained electrolyte in

each cell. The method presented reduces the time

#### UNCLASSIFIED

ZOMD2 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) AD-A039 335

Nickel/Cadmium Aircraft Batteries: Rapid Electrolyte Exchange Technique.

3

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Feldman, K. ; Hayashi, R. M. DESCRIPTIVE NOTE: Technical note, 15P APR

UNCLASSIFIED REPORT DRE0-TN-77-8 REPT. NO.

\*Electrolytes, Aircraft equipment, Potassium compounds, Hydroxides, Carbonates, Contamination, Exchange, Canada DESCRIPTORS: \*Nickel cadmium batteries,

IDENTIFIERS: Aircraft batteries

33

soaked into the separator materials and plate pores, and is hild in the pack, so only a small portion of it may be poured out. Repeated removal and replacement of these small amounts can accomplish the factors involved and presents a vacuum technique for battery after each small exchange and hence is very limits it is advisable to exchange the electrolyte. desired exchange if the clear added electrolyte is adequately mixed with the contaminated electrolyte cadmium aircraft batteries may become increasingly more contaminated by carbonate with battery use. time consuming. This paper discusses the various When the carbonate concentration exceeds certain each time. In the normal procedures, mixing is accomplished by discharging and recharging the The potassium hydroxide electrolyte in nickel/ However, most of the electrolyte in a cell is

UNCLASSIFIED

AD-A039 336

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY COLO

3 Experimental Optimization and Characterization of a LiA!/NaA!CI4/MoCI5 Pelletized Thermal Cell.

DESCRIPTIVE NOTE: Technical rept. Jun 75-Feb 77, FEB 77 44P Nardi, John C. ; Erbacher, John K. ; Hussey, Charles L. ; King, Lowell A.

FUSRL-TR-77-0002

# UNCLASSIFIED REPORT

3 \*Thermal batteries, \*Electrochemistry, Electrolytes, Aluminum Compounds, Sodium chloride, Anodes, Lithium alloys, Aluminum alloys, Molybdenum compounds, Cathodes, Power, Graphite, Chemical composition, Electric discharges, Auxiliary power plants, Military applications, Aerospace systems

IDENTIFIERS: Molybdenum pentachloride, PE61102F, DESCRIPTORS:

WUFJSRL2303F207

3

3 optimum conditions of temperature and discharge rate to produce maximum energy output. The optimal cell configuration delivered 38 W-hr/lb at a discharge rate of 15 mA/square cm at 175 C. The first application of a derivative discharge function to graphite current collector. The optimization of the catholyte composition was investigated. Battery A new moiten sait thermally activated reserve battery utilizing immobilized liquid NaAlCl4.as the electrolyte is described. Lithium-aluminum thermal cell analysis characterizes the complex alloys are employed as anodes with a cathode of battery with respect to anode, electrolyte and discharge behavior was characterized, defining Moc15 in intimate contact with a powdered discharge mechanism. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY -A038 754 7/3 10/3 NAVAL SURFACE WEAPONS CENTER WHITE DAK LAB SILVER SPRING

Development of an Improved Separator Material for Alkaline Silver-Zinc Batteries.

DESCRIPTIVE NOTE: Preliminary Study Dec 75-May 76 Kilroy, W. P. ; Duffy, James 27P FEB .7

REPT. NO. NSWC/WOL/TR-76-135

F43431 PROJ:

SF43431302 TASK:

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: \*Polymeric films, \*Battery separators, \*Silver zinc batteries, Cellophane, Charge transfer, Electrical resistance, Chemical properties, Potassium compounds, Hydroxides, Oxidation, Silver oxides, Porosity, Membranes, Pyrolysis, Phenols, Molecular weight IDENIFIERS: Polyvinylpyrrolidone, Polyphenylquinoxalines, Potassium hydroxide, PE62543N, WUWR33BB501

membranes, various methods were studied to develop porosity. Included among these were extraction of the PVP in boiling water, pyrolysis of the PVP, swelling of the films with phenol, and precipitation of the PVP appears very promising and additional studies are recommended since these stability to oxidation was observed in KOH solution saturated with silver oxide at 353 K. In an chemical stability with cellophane and to determine Drimary purpose was to compare its dimensional and This work was a preliminary investigation to determine if polyphenylquinoxaline (PPQ) or a codispersed mixture of polyvinylpyrrolidone (PVP) with PPQ could be used to replace cellophane as a effort to lower the resistance of these thin film Separator in the zinc-silver oxide battery. The if methods could be developed to lower its high polymers have good potential use as separators. inherent electrical resistance. Dimensional measurements were made in 45% KOH at 298 K (25 C) and 353 K (80 C). Chemical

AD-A038 754

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OMC LY 221 LIED

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD-A037 722 DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

Nickel/Cadmium Aircraft Batteries: Single Sensor Temperature Monitoring. DESCRIPTIVE NOTE: Technical note,
MAR 77 13P Feldman, Keiva; Hayashi,
Robert;

T. NO. DREO-TN-77-3

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Abstract in French.
DESCRIPTORS: \*Nickel cadmium batteries, Aircraft equipment, Short circuits, Failure(Electronics), Temperature, Warning systems

3

Most of the failures of nickel/cadmium batteries in aircraft are triggered by the development of a short circuit in a single cell in the battery. An experiment was conducted to determine whether the use of a single temperature sensor on an intercell link would be adequate to warn of a short circuit in a cell located elsewhere in the battery. The results indicate that this would not be adequate.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A037 721 10/3 13/10.1 DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

Survey of Continuous Sources of Electrical Power for Under-Ice Propulsion of Small Submersibles. Part II. New High Energy Density Systems,

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3

MAR 77 20P King, Thomas E.; Moroz, Walter J.; REPT. NO. DREO-R-757

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Abstract in French. See also

Part 1, AD-A035 996.
DESCRIPTORS: \*Primary batteries, \*Storage batteries, \*Underwater propulsion, \*Submersibles, High energy, High density, Electrochemistry, Electric power production, Underice, Water activated batteries, Metal air batteries, Solid electrolytes, Canada

3

New, high energy density electrochemical systems are discussed from the point of view of meeting the forecast electrical requirements for the SDL-1 submersiale in the 1980-90 time frame. Three main categories of systems are considered; namely, aqueous, metal/oxygen, and high temperature. Since most new high energy density systems are still in the conceptual stage, with many engineering problems yet to be resolved, the technical and economic merits are reviewed mainly in general terms. The systems with the best near and long term development potential are critically examined and assessed. (Author)

PAGE

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A037 703 10/3 7/4 9/5
ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH N J

Primary Battery Session Utilization of the Mg/MnG2 Dry Cell System,

 $\widehat{\Xi}$ 

UNCLASSIFIED REPORT

Wood, Donald B.

36

Supplementary NOTE: Presented at Annual Proceedings
Power Sources Conference (26th) May 1974.

DESCRIPTORS: \*Dry batteries, \*Magnesium batteries,
\*Nickel cadmium batteries, \*Primary batteries,
Thermal insulation, Electrical loads, Electric
charge, Hybrid systems, Low temperature, Heat
loss, Direct current, Magnesium oxides

IDENTIFIERS: Duty cycles, Clamping circuits
(U)

Two methods for improving the performance characteristics of the magnesium dry cell have been explored. In the first approach, the improvement was obtained with a hybrid system consisting of the magnesium/mangange dioxide (Mg/MnO2) dry battery and the nickel cadmium (Ni-Cd) rechargeable battery under intermittent discharge conditions. In the second approach the benefit in performance was achieved by insulating the Mg/MnO2 battery against heat losses. The combined influence of both approaches lead to very substantial improvements in low temperature, high current discharge performance. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A037 702 10/3 ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH N J

Primary Battery Session. Simulated Field Tests on Zinc-Air Batteries,

3

74 3P Almerini, A. L. ; Bartosh, S.

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at Annual Proceedings Power Sources Conference (26th) May 74.

DESCRIPTORS: \*Metal air batteries, \*Water activated batteries, \*Primary batteries, Reserve batteries, Anny equipment, Field tests, Simulation IDENITFIERS: Mechanically rechargeable batteries, (U)

In recent years considerable interest has been shown by the military and private industry in various zinc-air batteries because of their potentially high energy density. Zinc-air (Zn-Air) batteries may be divided into three categories: (1) the reserve primary battery, activated with water prior to use, (2) the non-reserve primary, and (3) the mechanically rechangeable type. (U)

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DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

-A037 701 10/3 ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH AD-A037 701

Lithium Battery Session. Secondary Batteries. Secondary Lithium Batteries,

 $\widehat{\Xi}$ 

Salomon, Mark ; 3

## UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Presented at Annual Proceedings Power Sources Conference (26th) May 74.
DESCRIPTORS: \*Storage batteries, Lithium, Halides, Sulfides, Ions, Room temperature, Solvents, Gold, Chlorine, Conferences

3 both film formation and decreasing limiting currents. General: In previous works, it was found that lithium is not generally stable in aprotic solvents but does react with such solvents as PC = formamide). It has also been found that the trace problem and a considerable amount of basic work remains to be done before practicality is achieved. It does appear, however, that the presence of SG2 stabilizes the Li-anode is most aprotic solvents. organic solvents has turned out to be a complex Thus, the stability of the lithium in aprotic propylene carbonate) and DMF = (dimethy)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY . SEARCH CONTROL NO. ZOMOT

ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH AD-A037 700

3 Primary Batteries. Lithium Battery Session. An Overview of the Primary Lithium Battery Program,

Gilman, Sol ; 44 74

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at Annual Proceedings Power Sources Conference (26th) May 74.
DESCRIPTORS: \*Primary batteries,
Reactants(Chemistry), Oxides, Oxychlorides,
Lithium, Electric discharges, Sulfides, High
energy, Sulfur oxides, Carbon, Heavy metals,
Fluorine, Cathodes(Electrolytic cell),

Conferences

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liquid cathode reactants, sulfur dioxide has served as the basis for the most successful lithium cell yet fully developed. Providing engineering and served as the basis for a successful sealed low-rate cell. Improvements appear quite possible through the utilization of modified (CF)' formulations and of other carbon-fluorine compounds. Amongst the stability problems are solved, thionyl chloride and other oxyhalides of phosphorous and sulfur may provide the basis for cells of much better performance than that of the Li-S02 system. reserve lithium primary cells. Amongst the solid cathode reactants, carbon monofluoride has already both solid and liquid cathode reactants for non-Advances have been made recently in the area of

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PAGE

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

-A037 699 10/3 10/2 ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH

Battery Charging Session. Investigation of Charging Methods for Nickel-Cadmium Batteries,

3

Wagner, Otto C. ; Williams, 4P Dorothy D. :

## UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Presented at Annual Proceedings Power Sources Conference (26th) May 74.

DESCRIPTORS: \*Nickel cadmium batteries, \*Battery chargers, Electric charge, Capacity(Quantity), Electric discharges, Anodes(Electrolytic cell), Electrodes, Rates, Energy, Conferences

3 for many years alternating current superimposed on direct current and periodic reverse current have been employed by the electroplating industry for the purpose of attaining smooth and bright on the effects of pulse and direct current charging on the electrical performance of nickel-cadmium periodic reverse current. This paper presents data electrodeposits. Several reports have been made on the effects of charging batteries by pulsing or

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH AD-A037 698

Secondary Battery Session Improved Aircraft Battery, Duze, Sylvia A. ; Hill, James 74

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at Annual Proceedings DESCRIPTORS: \*Nickel cadmium batteries, Modification, Aircraft equipment, Army aircraft, Storage batteries, Electrical properties IDENTIFIERS: BB-433/A batteries Power Sources Conference (26th) May 74.

33

3 cycling tests and other electrical and environmental At the 23rd Annual Power Sources Conference a proposed redesign of a standard 19-cell 22.8 volt nickel-cadmium aircraft battery (BB-433/A) rated at 30 Ah at the one hour rate was discussed. Battery BB-433/A has been widely assigned in efforts have been spent on the development of the failure reports from the field. Since that time, tests were performed on standard and redesigned redesigned battery. Simulated aircraft service Army aircraft and has been the subject of many batteries to determine the feasibility of the redesign concept.

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PAGE

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH AD-A037 697

Lithium Battery Session. Evaluation of Designs for Safe Operation of Lithium

Brooks, Edward S. 36 74

## UNCLASSIFIED REPORT

33 SUPPLEMENTARY NOTE: Presented at Annual Proceedings Power Sources Conference (26th) May 74.
DESCRIPTORS: \*Storage batteries, Lithium, Organic compounds, Electrolytic cells, Safety IDENTIFIERS: \*Lithium batteries

design and incorporate safety features in their cells without a satisfactory safety feature, also exploded and batteries which would preclude an explosion, fire, or emission of noxious gases regardless of the condition to which the battery or cell was subjected Early in the ECOM lithium-organic electrolyte battery program it became apparent that design for safety would be one of the paramount factors in the development of batteries for military applications. In this early period, companies experienced fires and/or explosions which presented hazards to personnel and equipment. Most of these incidents were presumed to have been caused by short circuit cell and the Battery BA-5590( )/U, a nominal 24 volt battery consisting of 10 lithium D when short circuited or incinerated. In order to purpose of this program was to have each company conditions internal to the cell. Lithium cells, electrical performance with a lithium cell. The The test vehicles for this program were the D resolve this problem, ECOM initiated a safety program with three companies, Eagle-Picher and Mallory, who had demonstrated successful Industries, Inc., Power Conversion Inc.,

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD-A037 676

Transition Metal Compounds as Cathodic Materials in Rechargeable Lithium Cells

3

Hunger, Herbert F. ; Ellison, DESCRIPTIVE NOTE: Technical rept., 19P

3

REPT. NO. ECOM-4474 61102AH47 Joseph E.

TASK: PROJ:

## UNCLASSIFIED REPORT

\*Storage batteries, \*Transition metal compounds, Cathodes(Electrolytic cell), Lithium, Organic compounds, Electrolytic cells, Oxides IDENTIFIERS: \*Rechargeable lithium batteries, DESCRIPTORS:

\*Lithium batteries, Chalcogenides, WU491, ASH47, PE61102A

3

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charge discharge experiments, the capacity loss after A comparison was made between rechargeable lithium batteries, based on lithium intercalation or lithium interstitial compounds of transition metal deep cycling was explored; the energy efficiency and the energy content of the system were determined. trioxide cells. The polarization characteristics of promise as cathodic materials. Preliminary experimental work was done with lithium-molybdenum batteries. Several chalcogenides and oxidies show the molybdenum trioxide cathode were studied and insight in the reaction mechanism was gained. In chalcogenides or oxides, and nickel-cadmium

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) 11/4 10/3 AD-A037 588

Separator Material for keserve-Primary Zinc/Air Batteries,

3

Armstrong, William A. ; Wheat, REPT. NO. DREO-R-756 23P MAR 77

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Battery separators, \*Metal air batteries, \*Reserve batteries, Glass, Copolymers, Vinyl plastics, Paper, Glass fibers, Composite SUPPLEMENTARY NOTE: Abstract in French.

materials | DENTIFIERS: Vinyon, \*Zinc air batteries

33

3 used in zinc/air batteries do not wet readily when placed in contact with alkaline electrolyte at -40 c. They are, therefore, unsuitable for use in a reserve-primary zinc/air battery which must be capable of rapid activation and operation at any temperature in the range -40 C to 50 C. A glass-Vinyon separator which meets the requirements It has been found that separator materials commonly of this type of battery has been developed. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

DOW CHEMICAL U S A WALNUT CREEK CALIF AD-A037 216

Research and Development of the Glass Fiber Sodium-Sulfur Battery.

3

DESCRIPTIVE NOTE: Final technical rept. 27 Mar 73-6 OCT 76 51P Levine, Charles; CONTRACT: DAHC15-73-C-0254, ARPA Grder-2381

## UNCLASSIFIED REPORT

Fabrication, Sodium compounds, Sulfur compounds IDENTIFIERS: \*Sodium sulfur batteries, \*Wet cells, \*Glass fibers, Lire expectancy, Impurities, Battery components, DESCRIPTORS: \*Electric batteries, \*Storage

33

3 cell which uses the walls of fine hollow glass fibers as the electrolyte has led to much longer lasting cells capable of thousands of deep and rapid cycles. The longest lived multi fiber cell to date, cycling at over 90% depth, has undergone over 2300 cycles in 92 days and is still in operation. This cell should be capable of over 220 watt hours per kg. Cell life is shortened by certain impurities in the Na, by nonfused tubesheets, and by fibers weakened Development work in the sodium-sulfur rechargeable during processing. Removal of these harmful effects, problems in scaling up cell size, in developing a metal case for the cell, in thermal cycling, and in fabrication of the cell parts are described. (Author)

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ZOM07 DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

DOW CHEMICAL U S A WALNUT CREEK CALIF 10/2 AD-A037 215

Research and Development in the Glass Fiber Sodium-Sulfur Battery.

3

DESCRIPTIVE NOTE: Semi-annual technical rept., JUL 76 21P Levine, Charles; CONTRACT: DAHC15-73-C-0254, ARPA Order-2381

### UNCLASSIFIED REPORT

33 ESCRIPTORS: \*Electric batteries, \*Storage batteries, \*Wet ceils, \*Glass fibers, Fabrication, Sodium compounds, Sulfur compounds, Life expectancy, Test methods, Impurities IDENTIFIERS: Sodium sulfur batteries

Degradation; Testing of Cells and Evaluation; and Back-up for Cell Fabrication and Methodology: Technical Results; Implications for Further Research; Jauses of Cell Contents: Technical Problems; General

3

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMOT DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J Modified AN/PSM-13 for Field Testing BA-4386/PRC-25. 14/2 AD-A037 002

DESCRIPTIVE NOTE: Research and development technical

3

Wood, Donald B. JAN 77 32P REPT. NO. ECOM-4461

### UNCLASSIFIED REPORT

equipment, \*Electric batteries, Electric charge, Portable equipment, Radio equipment, Magnesium, Radar equipment, Electrical loads
IDENTIFIERS: AN/PSM-13, AN/PRC-77, AN/PPS-15, Battery testers, Zinc carbon batteries \*Test equipment, \*Maintenance DESCRIPTORS:

3 3

Test set, Battery, AN/PSM-13, using the loaded voltmeter technique, was designed to predict minimum remaining capacity for a number of zinc-carbon batteries. When the magnesium Battery BA-4386/PRC-25 was introduced into the military supply system, Test Set Battery AN/PSM-13 was used with this battery but with inaccurate results. A program was established to determine the factors that influence the operation of the AN/PSM-13 with the magnesium Battery BA-4386/PRC-25 and to design and fabricate a modified version of the tester which would adequately test the to battery. Two loaded voltage values were selected to predict the battery state-of-charge relative to its its capacity remaining; however, it could have up 100%. The results of the evaluation to determine the accuracy of the modified AN/PSM-13 in predicting the capacity remaining in Battery BA-4386/PRC-25 are presented. (Author) battery's fresh capacity is remaining; the lower point no less than 15%. A reading between the two points indicates the battery has at least 15% of voltage point indicates that at least 85% of the use in Radio Set AN/PRC-77. The upper

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AD-A037 002

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BLBLIDGRAPHY

AD-A036 280

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J Rechargeable Metal Oxide-Hydrogen DESCRIPTIVE NOTE: Research and development technical Wynn, James E. ; rept

77 22P 1L762705AH94

PROJ:

## UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Storage batteries, Nickel compounds, Silver compounds, Oxides, Spaceborne, Spacecraft components, Artificial satellites
IDENTIFIERS: \*Metal oxide hydrogen cells, Nickel oxide hydrogen cells, Silver oxide hyrogen cells, WU181, ASH94, PE62705A

3

using platinum cetalyzed hydrogen anodes, nickel-oxide cathodes, and a two component separator system, Pellon/PKT, saturated with 30% KOH electrolyte. Also, silver oxide-hydrogen cells (rated 1.5 ampere-hours) were fabricated using similar platinum catalyzed hydrogen anodes, silveroxide cathodes, and two different separator systems, pellon/PKT and Dynel/cellophane/Pellon, measured at room temperature at current densities up saturated with 30% KOH electrolyte. The charge and discharge performance capabilities of the two types of electrically rechargeable cells have been Faradaic and thermodynamic efficiencies and cycle life of the cells have been determined at various charge and discharge rates. (Author) Electrically rechargeable nickel oxide-hydrogen to 100 milliamperes per square centimeter. The cells (rated 1.0 amperehour) were fabricated

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#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MO7

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) 13/10.1 13/10 10/3 AD-A035 996

Survey of Continuous Sources of Electrical Power for Under-Ice Propulsion of Small Submersibles. Part I. Conventional Secondary Batteries,

3

3

King, Thomas E. ; Moroz, 32P FEB

DRE0-R-755 Walter J. REPT. NO. C

## UNCLASSIFIED REPORT

3 3 Temperature, Discharge, Capacity(Quantity)
IDENTIFIERS: 300 AMPERE HOUR BATTERIES, 800 AMPERE DESCRIPTORS: \*Storage batteries, \*Submersibles, \*Underwater propulsion, Lead acid batteries, Underice, Silver zinc batteries, Pressure, SUPPLEMENTARY NOTE: Abstract in French. HOUR BATTERIES

Canadian Forces SDL-1 submersible. These battery systems are compared in terms of their physical and chemical characteristics and cost. Of the power sources considered, the improved flat plate lead acid battery is the most suitable choice to meet the present 300 Ah application. The silver/zinc system with its high energy density is the only one capable of meeting the forecast 800 Ah requirement. SYSTEMS THAT CAN BE USED FOR THE PROPULSION OF THE THIS REPORT REVIEWS CANDIDATE SECONDARY BATTERY

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DOC REPORT BIBLIUGRAPHY SEARCH CONTROL NO. ZOMOT

-A035 942 10/2 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N U AD-A035 942

Methanol-Air Batteries.

3

DESCRIPTIVE NOTE: Research and development technical Perry, John , Jr; JAN 77

77 32F ECOM-4457 1L762705AH94 REPT. NO

UNCLASSIFIED REPORT

Anodassium compounds, Hydroxides, Carbinols, Air, Anodass. Cathodes, Methyl radicals, Formates, Low temperature batteries

IDENTIFIERS: Methanol air batteries, PE62705A, \*Fuel cells, \*Electric batteries, DESCRIPTORS:

ASH94, WU032

3

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3 the operational requirements of low power equipments, such as sensors, mines, and similar equipments.

While primarily designed to satisfy low level output requirements, the system is capable of supporting transient peak loads on a cyclical basis. Cells charged with 120 ml of anolyte, consisting of 6 M methanol in 11 M MWH, have operated for 2, 230 hours under cyclic load drains of 50 mA\_for 13 minutes and 2 A for 1 second. One cell operated for more than 8,000 hours with periodic refilling of cells charged with an anolyte solution of methanol in fresh anolyte, demonstrating the long serviceable life of the electrode components. Fuel utilization efficiencies as high as 84% have been obtained from potassium hydroxide. Single cells charged with a fuel mixture of methanol and methyl formate in 5 M The methanol-air battery shows promise of meeting decrease in voltage du ing the 2 A period of the KOH operated satisfactorily under load at temperatures down to -40 C, with only a 30%

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

EAGLE-PICHER CO JOPLIN MO COUPLES DEPT

Final Technical Report for BA 494 /U,

3

Spracklen, D. H.; 76 30P Spr 4212-T-1176 DAHC60-72-C-0053 REPT. NO. 2 N

UNCLASSIFIED REPORT

DESCRIPTORS: \*Silver zinc batteries, \*Wet cells, \*Primary batteries, \*Guided missile batteries, Storage, Life expectancy, Environmental tests IDENTIFIERS: Safeguard

33

chosen batteries from Lot 22 which have been stored for 54 months at 120F. The failure of some specimens to maintain 14.0 volts after ground power cut-off is discussed in this report. It also contains Discharge Data Sheets, Activation Traces, curves showing X trends for Rise Time and Capacity, and summaries. This report also includes information concerning testing of two batteries stored 9 years, one at room temperature and one at 110F, along with accumulated data from Lot 19. These batteries performed well. (Author) This report covers the testing of two randomly

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AD-A035 942

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AD-A035 722 20

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#### AD-A035 409

#### UNCLASSIFIED

-A035 409 10/3 7/2 7/3 CALIFORNIA UNIV LOS ANGELES SCHOOL OF ENGINEERING AND DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

3 Lithium-Graphite Secondary Battery. APPLIED SCIENCE

Bennion, Douglas N. ; DESCRIPTIVE NOTE: Technical rept., Deshpande, Sanjay L. : REPT. NO. UCLA-ENG-76127 CONTRACT: N00014-75-C-0794 89P DEC 76

## UNCLASSIFIED REPORT

3 compounds, \*Graphited materials, Electrolytes, Iransport properties, Electrolytic cells, Storage batteries, Solvents, Electric charge, Stoichiometry, Anions, Cations, Fluorine atoms, Lithium perchlorale, Circuits, Test equipment, \*Electric batteries, \*Lithium Experimental data DESCRIPTORS:

IDENTIFIERS: Lithium tetrafluoroborate, DMSU(Dimethylsulfite), PC(Propylene Carbonate)

3

Reactions occurring at the positive and negative

battery in the charging and discharging reactions has been investigated. (Author) type Li/Liclo4, DMSU/Graphite have been studied. Experiments were performed in an H-cell wherein the two electrodes of the cell were isolated in compartments separated by a porous glass frit. effect of operating current on cell performance has been studied. The role of each component of the Discharge capability of 36 hours at a current density of 2 mA/cm square have been demonstrated. versus a lithium wire reference electrode. The Discharge potential was about 3.00 V measured

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

0-8033 323 10/1 10/3 10/2 OFFICE OF NAVAL RESEARCH LONDON (ENGLAND) AD-A033 323

The International Power Sources Symposium (10th).

3

DESCRIPTIVE NOTE: Conference rept., ONRL-C-30-76 139 NEPT. NO. ONP.

## UNCLASSIFIED REPORT

\*Energy storage, \*Energy conversion, \*Fuel cells, \*Storage batteries, Symposia, High energy, High density, Ground vehicles, High temperature, Performance (Engineering), International DESCRIPTORS:

those most suitable for electrically powered vehicles. An introductory discussion of the principles of batteries and measures of performance secondary batteries with high energy density, i.e., presented. Emphasis in the review is placed upon A summary is given of the 10th International Power Sources Symposium at which 48 papers were is also included. (Author)

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB
Solid Electrolytes: Alkaii-Ion Transport
in Skeleton Structures. (U)

DESCRIPTIVE NOTE: Semiannual technical summary rept. 1
Jan-30 Jun 76,
JUN 76, 22P Goodenough, John B.; Hong,
Henry Y-P.; Kafalas, James A.; Dwight, Kirby

CONTRACT: F19628-76-C-0002, NSF-AER74-02094 PROJ: ARPA Order-2696

PROJ: ARPA Order-2696 MONITOR: ESD TR-76-242

### UNCLASSIFIED REPORT

Supplementary Note: See also report dated 31 Dec 75, AD-A022 199.

DESCRIPTORS: \*Solid electrolytes, \*Alkaline batteries, \*Transport properties, Silicates, Compounds, Magnesium compounds, Sodium compounds, Phosphates, Sodium compounds, Sulfides, Fused salts, Electric batteries

IDENTIFIERS: Sodium-sulfur batteries, Magnesium potassium silicates, Silicon sodium zirconium

K(1.9)Mg(0.95)Si(1.05)O(4) has been identified. Its resistivity at 300C is 28 ohm-cm, less than one-fourth the value for the best potassium beta-alumina. More definitive measurements have been made of the Na(+)-ion transport in Na3ZrSi2Pois (NASICON). Its resistivity at 300C is 3 ohm-cm, compared with 4 ohm-cm for beta double prime-alumina. Moisture tests have shown that NASICON is insensitive to water vapor. Static tests in molten Na2S4 for 10 days at 400C indicate chemical stability; similar tests in molten Na and dynamic tests in a Na-Na cell are in progress. Conclusive evaluation of stability awaits the preparation of additional test specimens.

### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AD-A031 866 10/3 1/3
DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

Nickel/Cadmium Aircraft Batteries: High Rate Discharge Equipment.

3

DESCRIPTIVE NOTE: Technical note,
SEP 76 25P Feldman, K.; Haines, R. L.
LePage, W.;
REPT. NO. DREO-TN-76-22

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Abstract in French.
DESCRIPTORS: \*Nickel cadmium batteries, jest
equipment, Aircraft engines, Engine starters, Gas
turbines, High rate, Electric discharges,
Canada
IDENTIFIERS: \*Aircraft batteries

33

Factors that are not of major significance in low rate battery discharges become quite important when a battery is used to crank an aircraft turbine engine. Apparatus was designed and built to facilitate the study of nickel/cadmium aircraft batteries when used in this and other high rate applications. Maximum discharge rates of 1000 amperes or more are possible with 24-volt batteries. Load configurations may be readily modified. Discharge profiles are simulated by use of fixed load steps which may be timed either automatically or manually. This document describes the equipment and gives instructions for its use.

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phosphates

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Author)

UNCLASSIFIED

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) AD-A031 704

Superconducting Motors and Lithium-Water Batteries for Torpedo Propulsion.

3

Johnson, A. W. DESCRIPTIVE NOTE: Technical note, JUL 76 14P Johnson, A REPT. NO. DREG-TN-76-18 JUL 76

## UNCLASSIFIED REPORT

3  $\widehat{\Xi}$ DESCRIPTORS: \*Torpedoes, \*Torpedo motors, \*Sea water batteries, Electric motors, Superconductivity, Underwater propulsion, Lithium, Canada IDENTIFIERS: Mark-37 torpedoes, Superconducting motors, Lithium cells

 $\widehat{\Xi}$ presently-available information suggests that the performance of the MK 37 torpedo could be improved by the use of a superchaducting electric motor powered by a lithium-seawater battery. Details are given and recommendations for future work are described.

#### UNCLASSIFIED

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

1-4030 627 11/3 7/4 5/2
STANFORD UNIV CALIF CENTER FOR MATERIALS RESEARCH Solid Electrolyte Battery Materials. 11/3 AD-A030 627

3

DESCRIPTIVE NOTE: Final rept. for period ending 30 Jun

Huggins, Robert A. ; SEP 76 24P HUG REPT. NO. CMR-76-12 CONTRACT: N00014-75-C-1056 PROJ: NR-056-555

## UNCLASSIFIED REPORT

batteries, \*Materials, \*Reports, Oxides, Polymers, Ions, Lithium compounds, Titanium compounds, Titanium compounds, Scientific research, Alkali metals, Potassium compounds, Aluminum compounds, Silicates, Graphite IDENTIFIERS: Battery materials, Publications, Ionic current, Ion mobility, Hollandite, Potassium tetrafluoroaluminate, Intercalation DESCRIPTORS: \*Solid electrolytes, \*Electric compounds

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conductors and mixed ionic-electronic conductors, as well as the investigation of a novel technique for the preparation of oxide solid electrolytes. Especially interesting were the results on several groups of new lithium ionic conductors. measurements on a number of potential ionic Work involved the preparation and property This is the Final Report on this contract. (Author)

3

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AD-A031 704

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

ESB INC RALEIGH N C WISCO DIV AD-A030 105

An 8-Hour AN/SSQ53 Lead Chloride Magnesium Battery.

3

DESCRIPTIVE NOTE: Final rept. 15 Jul 75-15 May 76, MAY 76 18P Jordan,Alfred W.; CONTRACT: N62269-75-C-0397

### UNCLASSIFIED REPORT

3 3 batteries, Sonobuoys, Power supplies IDENTIFIERS: AN/SSQ-53, \*Lead chloride magnesium batteries, \*Sonobuoy batteries, Most Project-11 \*Sea water batteries, \*Primary DESCRIPTORS:

voltage of 11.0 volts at 180 seconds of discharge for batteries tested in 0C-1.5% salinity seawater. Voltage readings at 180 seconds of 4 samples tested possible, to reduce discharge current density to the range of 40 - 50 ma/sq in. Additional effort is unreliable activation performance can be attributed also required to optimize the design and processing cold ranged from 10.75 volts to 10.96 volts. This A program was undertaken to determine a workable design for an 8-hour life lead chloride-magnesium, seawater activated battery for use in the AN/SSQ53 sonobuoy. The majn effort consisted of design and fabrication of prototype samples for testing followed by production of 50 samples for delivery to the Naval Air Development Center to a high discharge current density (55ma/sq in.) in conjunction with variability in lead chloride cathode processing. It is recommended that additional volume be allowed for the battery, if for evaluation. Pesults of these tests indicated that the battery design met all specification requirements with the exception of the minimum parameters of the lead chloride cathode.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

GENERAL DYNAMICS/CONVAIR SAN DIEGO CALIF 22/4

Silver-Zinc Battery Characteristic Report,

3

Mikkelson, R. P. TR-76-174 66 398P Mi GDC-8GY66-007 AF 04(694)-240 SAMSO REPT. NO. CONTRACT: MONITOR:

## UNCLASSIFIED REPORT

batteries, Guided missile batteries, Failure(Electronics), Voltage, Electrolytes, Short circuits, Activation, Performance, Electric charge, Electrolytic cells, Potassium \*Launch vehicles, \*Silver zinc compounds, Hydroxides IDENTIFIERS: \*Atlas launch vehicles, Atlas, Potassium hydroxide

3 3

> This test program was undertaken to determine the effect on performance of the manually activated type silver-zinc battery as a result of partial charges, etc., because there had been no previous testing of cell shorts, improper filling, contaminated electrolyte, extended wet (activated) stand time, launch programs were selected for use in the test this nature on this type battery. Two versions of Silver zinc batteries currently in use at General 19 PM30 type cells and the Power Sources 200994 battery (GD-C Part Number 69-06308-1) program. They were the Yardney 61302 battery Dynamics Convair on the Atlas missile space consisting of 19 cells assembled into three (GD-C Part Number 69-06309-1) consisting of

AD-A027 770

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DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

EAGLE-PICHER INDUSTRIES INC JOPLIN MO ELECTRONICS DIV

Battery WOX93E (Eagle-Picher CAP

3

DESCRIPTIVE NOTE: Final rept., MAY 75 54F Wilder, Gaylen L.; CONTRACT: N60921-73-C-0375

## UNCLASSIFIED REPORT

ESCRIPTORS: \*Thermal batteries,
\*Spinning(Motion), Reliability(Electronics),
Thermal insulation, Life tests DESCRIPTORS:

3

3 The WDX93E battery is a high spin thermal battery capable of providing 1 amp at 15 volts while undergoing an axial spin of 250 to 410 RPS. This report documents the development, testing and evaluation of the battery from July 1973 until

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

7-A026 551 10/3 CALIFORNIA UNIV LOS ANGELES SCHOOL OF ENGINEERING AND APPLIED SCIENCE AD-A026 551

Engineering Analysis of Shape Change in Zinc Secondary Electrodes.

3

DESCRIPTIVE NOTE: Final rept. Nov 73-Nov 75, MAR 76 133P Choi, King Wai ; Hamby, Drannan ; Bennion, Douglas N. ; Newman, John ;

CONTRACT: F33615-74-C-2004 PROJ: AF-3145 TASK: 314522 MONITOR: AFAPL

## UNCLASSIFIED REPORT

TR-76-9

DESCRIPTORS: \*Zinc, \*Electrodes, \*Shape, \*Silver Zinc batteries, Life expectancy, Storage batteries, Hydrodynamics, Convection, Flow, Battery separators, Membranes, Zinc oxides, Potassium compounds, Hydroxides, Mathematical models, Computer programs

3

3 secondary cell and tested by actual cell experiments. numerical calculations are compared quantitatively to that shape change can be eliminated if the convective flow in the zinc electrode compartment parallel to Shape change, the redistribution of active material over the zinc electrode surface as a result of cell cycling, is hypothesized to be caused by convective flows driven primarily by membrane pumping. A mathematical model is formulated based on the convective flow hypothesis for the zinc-silver oxide rates, variations of current distribution, and cell potential with the number of cycles. These The numerical solutions predict redistributions of zinc material over the zinc electrode, fluid flow the experimental observations. The results snow the electrode surface is stopped. (Author)

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DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

-4026 359 10/3 11/2 11/5 DOW CHEMICAL U S A WALNUT CREEK CALIF AD-A026 359

Research Development in the Glass Fiber Sodium-Sulfur Battery.

3

DESCRIPTIVE NOTE: Semi-annual rept. 1 Jul-31 Dec 75, DEC 75 30P Levine, Charles A.; CONTRACT: DAMC15-73-C-0254, ARPA Order-2381

## UNCLASSIFIED REPORT

3 3 IDENTIFIERS: \*Sodium sulfur batteries, High energy \*Storage batteries, \*Glass fibers, Sodium, Sulfur, Electrolytes, Electrochemistry DESCRIPTORS: batteries The sodium-sulfur battery based on hollow glass

fibers as the electrolyte has been shown to have outstanding characteriities as a rechangeable cell. It should be capable of 100 watt hours per pound at over 80 watts per pound, and not be damaged by charge/discharge cycling. The major problems are to obtain increased lifetimes, to demonstrate nonvariance in its electrochemical characteristics over thousands of cycles, and to assemble the cells into metal envelopes and into high voltage batteries. The batteries, like the cells, must be capable of long-lived non-variant operation. The problems are being defined and attacked by building and operating various size hollow fiber cells. These cells range from single fiber cells to cells containing many thousands of fibers. When these cells fail, the failure mode is analyzed. Small assemblies are example, single fibers or small bundles of fibers can effect of passage of sodium or a sulfide pool to test the effect of passage of sodium ions on the glass lifetime. As improvements are made, the cells are scaled up to confirm the improvements and to see if scaling up introduces new factors affecting the cell designed and built that can test specific parts of the cells which may be involved in the failure. For be assembled and used as a Na anode discharging and lifetime.

### UNCLASSIFIED

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

GENERAL ELECTRIC CORPORATE RESEARCH AND DEVELOPMENT SCHENECTADY N Y

Chemistry, Physics, and Applications, May 10-Program and Abstracts for the International Conference on Supersonic Conductors: 12, 1976.

3

DESCRIPTIVE NOTE: Final rept.,
MAY 76 56P Mahan,G. D. ;Roth,W. L.

TR-76-0699 CONTRACT: F44620-76-C-0087 MONITOR: AFOSR PROJ: AF-9767 TASK: 976704

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Electrochemistry, \*Storage batteries, \*Energy storage, \*Electrolytes, Ions, Diffusion, Fuel cells, Optical properties, Electrical conductivity, Raman spectra, Symposia, IDENTIFIERS: \*Superionic conductors Conferences

33

solid electrolytes to increase conductivity to that achieved in aqueous electrolytes. These solid electrolytes have a much wider temperature range and are needed to be used in new high energy, high charge and discharge rates rechargeable batteries. The Conductors and the new problems in physics created by Substantial improvements are needed in organic and discussions among scientists from diverse fields regarding the status of understanding superionic objectives met in this symposium is to foster advancing technology. (Author)

AD-A026 352

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DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD-A026 197 10/3 DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) Nickel/Cadmium Aircraft Batteries: Failure Prediction in Battery Shops by Gassing Rate Measurements.

3

DESCRIPTIVE NOTE: Technical note,
MAY 76 21P Feldman, K. ; Haines, R. L.
Hayashi, R. ;
REPT. NO. DRED-TN-76-12

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, \*Aircraft equipment, Test methods, Reliability(Electronics), Predictions, Gases, Battery separators, Thermal stresses

One of the serious problems which face a battery shop responsible for maintenance of nickel/cadmium aircraft batteries is to identify cells which would be likely to fail during the next period of service on board the aircraft. At present it seems that nearly all of the catastrophic battery failures which arise on board aris due to failure of the separator materials in the cells. In the majority of cases it is likely that gradual deterioration of the separators takes place over a period of time at a rate which in large measure depends on the details of the stress to which the battery is subjected, and in particular to the thermal stress involved. This document discusses two modes of failure due to separator deterioration and how the deterioration may be detected at an early stage by measurement of gas (U)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL\_NO. ZOMO7

AD-A024 658 10/3 7/4 STANFORD UNIV CALIF CENTER FOR MATERIALS RESEARCH

Solid Electrolyte Battery Materials.

3

DESCRIPTIVE NOTE: Technical rept.,

DEC 75 128P Huggins, Robert A.;

REPT. NO. CMR-76-7, TR-5

CONTRACT: N00014-75-C-1056

PROJ: NR-056-555

## UNCLASSIFIED REPORT

Supplementary NOTE: See also report dated 31 Mar 75, AD-A012 098.
DESCRIPTORS: \*Battery components, \*Storage batteries, \*Solid electrolytes, Alumina, Graphite, Ions, Ionic current, Cellulosic resins, Alkali metal compounds, Fabrication, Electrical measurement, Test methods, Electric conductors, Lithium compounds, Silicates, Nitrides, Sulfides, Germanates, Fluorides, Lead compounds, Clathrate compounds
IDENTIFIERS: Sodium sulfur cells, Lead fluorides,

Unaturate compounds

IDENIIFIERS: Sodium sulfur cells, Lead fluorides,
Lithium sulfides, Lithium germanates, Lithium
nitrides, Lithium cells, Lithium silicates,
Intercalary compounds, Graphite fluorine
clathrates

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This work has three major objectives: (1) to investigate a novel technique for producing beta-alumina solid electrolytes for use in scdium-sulfur cells, (2) to search for new fast ion conducting materials for protons or alkali metal ions, and (3) to examine certain mixed conductor materials for potential application in electrodes for advanced secondary battery designs.

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

ELC CORP NEWTON MASS . 1023 496

Sulfur-Based Lithium-Organic Electrolyte Secondary Batteries.

DESCRIPTIVE NOTE: Final rept. 3 Dec 73-29 Aug 75, MAR 76 171F Holleck ,Gerhard L.; Oriscoll, Joseph R.; Shuker, Fred S.; DAAB07-74-C-0072 DA-1-1-161102-A-34-A 1-T-161102-A-34-A-02 C-405 REPT. NO. CONTRACT: PROJ:

### UNCLASSIFIED REPORT

MONITOR: ECOM 74-0072-F

3 3 ESCRIPTORS: \*Alkaline batteries, \*Storage batteries, \*Organic solvents, \*Lithium, Sulfur, Polysulfides, Titanium compounds, Sulfides, Niobium compounds, Molybdenum, Vanadium compounds, compounds, Lithium cells, Organic batteries, Lithium titanium sulfide cells, Lithium niobium IDENTIFIERS: \*Lithium batteries, Intercalation sulfide cells, Lithium vanadium sulfide cells Cathodes(Electrolytic cell), Electrodes, Electrolytes, Electrochemistry Anodes(Electrolytic celi), DESCRIPTORS:

3 specifications would represent a considerable advance soluble sulfur positives, and positives based on higher sulfides of transition metals, particularly on in the state of the art. An analysis of possible alternatives suggested the likelihood of developing The overall aim of this program was the development of a rechargeable lithium battery utilizing an organic solvent. Specifications included operation investigated. Then, since only one of the two approaches towards sulfur based cathodes could be continued within the scope of this investigation, such batteries with positive electrodes based on sulfur. Two general classes are promising: sulfur-rich compounds of titanium, niobium and C), energy density approaching 100 Whr/1b, a cycle-life in excess of 500, and high charge retention. A system meeting all these over the range -40 to +160 F (-40 to +70 vanadium. Initially, both systems were

## UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 10/3 AD-A022 952

AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB Electrochemistry of Some New Alkaline

Pickett, David F. ; Bishop, Technical rept., 46P DESCRIPTIVE NOTE: 16 FEB

Battery Electrodes.

3

3

Wayne S. ; Marsh, Richard A. ; REPT. NO. AFAPL-TR-75-79 PROJ: AF-3145

314522

TASK:

## UNCLASSIFIED REPORT

3 3 \*Electrochemistry, Gas generating systems, Nickel compounds, Cadmium compounds, Oxides, Zinc, Conference on Spectroscopy and Cehmistry (1975) Los Angeles, Calif. 29 Oct 75. DESCRIPTORS: \*Electrodes, \*Alkaline batteries, Silver compounds, Sintering, Vacuum apparatus deposition, Vacuum impregnation, Nickel zinc batteries, Bipolar batteries SUPPLEMENTARY NOTE: Presented at the Pacific (DENTIFIERS: \*Battery electrodes, Spray

impregnated electrodes then removing electrolyte with prepared by cathodic precipitation techniques, appear research at the Air Force Aero-Propulsion Laboratory. Cathodic hydroxide precipitation techniques are used for preparation of nickel oxide and cadmium electrodes. Bipolar silver oxide-zinc electrodes are fabricated by spray deposition— sintering and vapor deposition techniques. Novel methods for preparation of dry charged nickel oxide as nickel oxide-cadmium, nickel oxide-hydrogen, nickel oxide-zinc, and silver oxide-zinc have been developed as a result of contracted and in-house New alkaline battery electrodes used in cells such activation, but on long term dry storage data is available. Secondary nickel oxide electrodes, far superior to other nickel oxide electrodes batteries are being investigated. One technique involves charging conventional sintered, vacuum a distilled water wash. Drying is performed in electrodes for reserve type nickel oxide-zinc vacuo. The plates yield rated capacity upon

PAGE

3

AD-A022 952

ZOMO2

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

-A022 467 10/3 ENERGY RESEARCH CORP DANBURY CONN

Development of Zinc Electrodes and Inorganic Separators for Large Size Silver-Zinc Batteries.

3

DESCRIPTIVE NOTE: Final technical rept. 4 Mar 74-31

CONTRACT: N00024-74-C-5262

UNCLASSIFIED REPORT

DESCRIPTORS: \*Silver zinc batteries, \*Battery separators, Inorganic materials, Electrodes, Additives, Silver, Zinc compounds, Monoxides (DENTIFIERS: Ampere hours, Zinc oxides

33

Three NR-1 and three DSRV (525Ahr) cells have been fabricated with the most promising design and have been delivered to NAD-Crane for life evaluate improved zinc electrode structures and inorganic separators developed by ERC. The 40Ahr cell groups have completed cycling and have During the nineteen month period of this contract both 40Ahr and 850Ahr (AR-1) size silver-zinc cells were designed, fabricated and tested to additives investigated did improve performance in cells with FSC separators but did not show an additional improvement when tested in cells with test evaluation. The most promising design from data obtained in both 40Ahr and 850Ahr cells appears to be a combination of FSC and ERC 2002 achieved 150-300 cycles depending on the cell construction. The NR-1 batteries have completed discharge regimes with the testing continuing. inorganic separator with KT separator on the negative electrode. The various negative plate 150-300 days of testing on both float and deep inorganic and FSC separators in combination.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

22/2 )-A022 350 10/3 SPECTROLAB SYLMAR CALIF AD-A022 350

Development of Nickel Alkaline Batteries for Aerospace Lightweight Secondary Power.

3

DESCRIPTIVE NOTE: Final rept. 1 Dec 72-30 Jun 75, Jun 75 170P Puglisi, Vincent J. ;Ralph,

JUN 75 170P PUG Eugene L. ; CONTRACT: F33615-73-C-2012

PROJ: AF-3145 TASK: 314522

TR-75-64 MONITOR: AFAPL

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, \*Spacecraft components, Electrodes, Fabrication, Porous materials, Impregnation, Mathematical models, Computer programs, Computer aided design IDENTIFIERS: Design

33

3 portion of the program was the investigative phase in design, the knowledge obtained from the investigative phase was successfully applied to a mathematical cell design model that was translated into computer cells was accomplished and two pilot production runs which theoretical and analytical studies were performed. The plaque formation process was optimized in respect to sinter porosity and loading level using an electrochemical impregnation technique. In order to develop the optimum cell This program successfully incorporated new improved electrode fabrication procedures into a small scale pilot production facility and produced advanced objectives of achieving a minimum energy density of 20 WHr/1b with the 50 AH sealed nickel-cadmium demonstrated that this objective was reached with language. A computer design of several cells that met the program objectives was then developed. reproducible results and good yields. The first lightweight aerospace nickel-cadmium cells. The

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N 10/3 AD-A021 977

Determination of the State of Discharge of Lithium/Organic Electrolyte/Graphite Fluoride Cells.

Hunger, Herbert F. ; Ellison, DESCRIPTIVE NOTE: Technical rept.,
MAR 76 18P Hunger, Herl PROJ: DA-1-T-161102-AH-47 TASK: 1-T-161102-AH-47-P-9 Joseph E. ; REPT. NO. ECOM-4391

## UNCLASSIFIED REPORT

MONITOR: GIDEP, GIDEP

E052-0095, 101.80.00.00-04-03

 $\widehat{\Xi}$ 3 DESCRIPTORS: \*Primary batteries, Electrolytic cells, Cathodes(Electrolytic cell), Graphite, Lithium, Fluorides, Discharge, Voltage IDENTIFIERS: \*Lithium organic electrolyte batteries, Lithium graphite fluoride cells

3 The state of discharge of lithium/organic electrolyte/graphite fluoride cells can be determined non-destructively by measuring the cell voltage rise or exchange current at the cathode, are suited for determining the state of dischange only under limited conditions of operation. (Author) determining the state of discharge amounted to 7.8% for a current density range of 0.2 - 2.0 mA/sq cm after termination of the load current. For a given Kinetic parameters, such as cathodic polarization for both continuous or intermittent operation.

#### UNCLASSIFIED

FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY COLO SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY AD-A021 748

High Energy Density Pelletized Aluminum Chloride Thermal Batteries.

3

Hussey, Charles L. ; Erbacher, DESCRIPTIVE NOTE: Final rept. Aug 74-Jan 76, John K. :King.Lowell A. : REPT. NO. FUSRL-TR-76-0003 PROJ: AF-7903 JAN 76 46P

3

## UNCLASSIFIED REPORT

TASK: 790302

DESCRIPTORS: \*Thermal batteries, \*Cathodes, Battery components, Primary batteries, Electric current, Anodes, Performance tests IDENTIFIERS: \*Aluminum chlorine cells, Design SUPPLEMENTARY NOTE: Errata sheet inserted. Criteria, Molten salt electrolytes

3 3

3 of aluminum, lithium, or aluminum-lithium alloys. A constant current discharge behaviors are discussed. electrolytes of molten aluminum chloride-sodium chloride mixtures are described. Anodes were made variety of cathodes was employed, including (a) transition metal oxides, halides, and sulfates/ graphite or megal powder, (b) halogen/graphite, (c) organic oxidants/graphite, (d) chalcogen/ Single cell pelletized thermal batteries using graphite, (e) intercalcate compounds/graphite, (f) alkali salts, peroxydisulfate salts. hypochlorite salts/graphite. Constant load and

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AD-A021 748

AD-A021 664

#### UNCLASSIFIED

ZOM02 SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY COLO

Exploratory Aluminum-Chlorine Thermally Activated Battery: Single Cell Experiments.

3

DESCRIPTIVE NOTE: Final technical rept. Mar 73-Nov 75, JAN 76 135P Brabson,G. Dana ;Erbacher, John K. ;King, Lowell A. ;Seegmiller, David

REPT. NO. FUSRL-TR-76-0002 AF-7903

PROJ:

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Thermal batteries, Aluminum, SUPPLEMENTARY NOTE: Errata sheet inserted. Chlorine, Aluminum compounds, Chlorides, Electrochemistry IDENTIFIERS: Molten salt, Single cells

33

3 the individual cells in a low temperature pile type thermal battery have been constructed and characterized. Both binary AICI3,NaCl and ternary AICI3. NaCl, KCl electrolytes were studied. Eight concentration cells with aluminum electrodes were tested. Twenty-three formation configurations tested in formation cells included: (1) C12, graphite, W; (2) NiC12, graphite, Ni and (3) C4.5F, graphite, W. Materials employed to immobilize the electrolyte Single cells which can be considered prototypes of can be achieved with formation cells; (3) Both NiC12, graphite, Ni and C4.5F, graphite, W are attractive candidate cathodes for formation cells. (Author) cells with aluminum anodes were studied; cathode Operating temperatures ranged from 109 C to 222 be effectively immobilized by Cab-0-Sil; Current densities in excess of 1 mA/sq cm included fiberglass felt and Cab-0-Sil. C. Key findings: (1) NaA1C14 meits

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL UNDERSEA CENTER SAN DIEGO CALIF AD-A020 844

Development of Lithium Inorganic Electrolyte Batteries for Navy Applications.

3

E054-1282,101.80.00.00-Y3-McCartney, J. F. ; Shipman, DESCRIPTIVE NOTE: Technical notes, OCT 75 105P MC
W. H. ;Gundersen, C. R. ;
REPT. NO. NUC-TN-1618
MONITOR: GIDEP, GIDEP E

### UNCLASSIFIED REPORT

Naval research, Balloon equipment, Oceanographic equipment, Lasers, Hermetic seals, Modification, \*Thionyl chloride, Inorganic compounds, Voltage regulation, Performance (Engineering), Weight, Safety, Environments, Discharge, Corrosion, Storage, Dry batteries IDENTIFIERS: Instrumentation, Reliability, DESCRIPTORS: \*Primary batteries, \*Lithium, \*Lithium cells, \*Lithium thionyl chloride

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During Fiscal Year 1975 the Naval Undersea Center (NUC) performed an extersive test programs with low-rate and high-rate lithium-thionyl chloride cells. This program has aided in identifying capabilities and deficiencies with the present used in several ocean oriented applications. Future high-discharge rate cells for propulsion and pulseadditional development is required. As a result of this program, improved, low-discharge rate, hermetically sealed cells and batteries are being development programs are planned to provide safe, Corrected but others are less understood and technology. Many deficiencies were readily power applications. (Author)

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AD-A020 844

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

-A020 420 10/3 11/6 13/8
UNION CARBIDE CORP CLEVELAND OHIO BATTERY PRODUCTS

Extruded Magnesium Tubing vs. Impact Extruded Cans in BA-4386/PRC~25 Magnesium Battery.

DESCRIPTIVE NOTE: Final rept. Jul 71-Dec 74, DEC 75 59P Urry, L. F.; CONTRACT: DAABO7-71-C-0235

ECOM 71-0235-F CONTRACT: MONITOR:

## UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: See also report dated Jun 75, AD-DESCRIPTORS: \*Primary batteries, \*Magnesium alloys, \*Extrusion, Dry batteries, Tubes, Containers, Anodes, Performance tests, Aluminum alloys, Zinc alloys, Costs

IDENTIFIERS: Magnesium "anganese oxide cells, Magnesium alloy 3Al 1Zn, Magnesium cells

3

3 little effect on performance, and since tubing would The composition of the magnesium alloy, and not how it is made into cans, seems to be more significant variable in the performance of BA-486/PRC-25 defermine if there was an effect on service, storageability and starting delays. Cells and batteries of both types were made simultaneously on extruded magnesium tubing were compared with those made by the conventional impact extrusion from magnesium rod, in BA-4386/PRC-25 batteries, to be more costly, impact extrusion seems preferable. the rod for the control cans was extruded from the same alloy batch used for the tubing. Thus processability of the tubing was demonstrated and standard production equipment, and since the AZ31 magnesium alloy specified was different from the AZ21 now standard for BA-4386/PRC-25 batteries, from tubing or by impact extrusion, seems to have variables were minimized. Whether the can is made Magnesium cells using cans made by plugging magnesium batteries.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

YARDNEY ELECTRIC CORP PAWCATUCK CONN AD-A020 365

Standard Line Rechargeable Battery Silver-Zinc 88519/U.

3

DESCRIPTIVE NOTE: Final rept. Jul 73-Jan 75, Skelton, J.; 37P 1818-75 REPT. NO.

3

DAAB07-73-C-0302 CONTRACT:

DA-1-G-763702-DG-10 1-G-763702-DG-1001 ECOM 73-0302-F MONITOR:

## UNCLASSIFIED REPORT

\*Silver zinc batteries, Potassium compounds, Hydroxides, Battery components, Reliability(Electronics), Manportable DESCRIPTORS:

Potassium hydroxides DENTIFIERS: equipment

33

these plates yield electrodes that offer strength and plate integrity sufficient to meet the environmental integrated into the standard line configuration. The addition of a high rate battery to the standard excellent capacity maintenance after extended cycle life. The silver electrode is made from fine Batteries have successfully demonstrated that a 16 Consists of silver and zinc electrodes. The electrolyte is a concentrated aqueous solution of Silver powder rolled onto a silver expanded metal grid. The zinc electrode is made from zinc oxide powder rolled onto a perforated copper grid. The Proprietary to Yardney and is designed to assure separator system is wrapped around the positive The electrochemical system used in this battery Pound Silver-Zinc battery yielding 25 Ah can be electrode. The manufacturing processes used on and mission requirements. The BB519 and BB462 Potassium hydroxide. The separator system is line, offers extended capability to man pack

AD-A020 365

PAGE

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applications.

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

TRW SYSTEMS GROUP REDONDO BEACH CALIF AD-A020 164

Investigation of High Temperature Battery Systems.

3

DESCRIPTIVE NOTE: Final rept. 1 Jul 74-31 Aug 75, DEC 75 60P Sayano,R. R. ;McClanahan, M. L. : Male, J. A. : Fried, N. : REPT. NO. TRW-26619-6013-RU-00 CONTRACT: DAABO7-74-C-0587 DA-1-S-762705-AH-94-P -S-762705-AH-94-P-02 MONITOR: ECOM 74-0587-F PROJ:

## UNCLASSIFIED REPORT

3 3 electrolytes, \*Storage batteries, High temperature, IDENTIFIERS: \*High temperature batteries, Sodium \*Electric batteries, \*Solid Sodium, Sulfur, Hermetic seals, Alumina aluminates, Sodium sulfur cells DESCRIPTORS:

3 beta-alumina electrolyte and the alpha-alumina rings, copper braze between the alpha-alumina rings and the technology and comprised a glass sealant between the operate at 300 C in atmospheric environment and to deliver 10 A for 2 hr above 1.0 V for 100 cycles with a specific power and specific energy of 110 W/kg and 110 W hr/kg, respectively, were designed and fabricated. The cells were to withstand five themmal cycles from operating temperature to room temperature without loss of electrical performance. These cells utilized a disk shaped magnesium oxide-Hermetically sealed sodium-sulfur cells intended to sulfur and/or sodium polysulfide. No catastrophic cell failure due to cell design or materials of construction has been observed during testing of a Kovar cell containers, and laser welds between the cover. Chromium plasma coating was used to protect Kovar cell containers and the stainless steel cell materials for cell containers. The seals used in enriched beta-alumina electrolyte with low cost the copper braze and Kovar against corrosion by the cell were al! based on state-of-the-art cell for over 800 hr.

#### UNCLASSIFIED

ZOWOZ DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

7/4 POWER CONVERSION INC MOUNT VERNON N AD-A020 144

Non-Hazardous Lithium Organic Electrolyte Batteries.

3

DESCRIPTIVE NOTE: Final rept. Jun 73-May 74, Abens, Sandors: AUG 74 47P ADE CONTRACT: JAAB07-73-C-0242 MONITOR: ECOM 73-0249-F

## UNCLASSIFIED REPORT

3 3 DESCRIPTORS: \*Primary batteries, Safety, Sulfur IDENTIFIERS: \*Lithium cells, Sulfur organic oxides, Performance tests, Electrolytes, Laboratory tests, Electrodes, Discharge, Electrochemistry, Vents compounds, Design criteria

design was found to operate reliably, rendering cells and batteries safe under all test conditions covered under Technical Guidelines for Non-Hazardous fabricate a high performance, low cost primary lithium-organic electrolyte battery capable of safe operation under any conditions of storage, use and disposal. In order to demonstrate compliance with The purpose of this program is to design, test, and batteries which incorporate a unique fail-safe design, developed for commercial applications. This these goals, PCI constructed and tested cells and Primary Lithium-Organic Electrolyte Batteries dated 29 March 1973.

3

AD-A020 144

ZOMO7 SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

HOWEYWELL INC HORSHAM PA POWER SOURCES CENTER AD-A020 143

3 Lithium-Organic Electrolyte Batteries for Sensor and Communications Equipment.

Final rept. 14 Jun 71-15 Mar 75. AUG 75 172; CONTRACT: DAAB07-71-C-0191 PROJ: DA-1-G-763702-DG-10 1-G-763702-DG-1001 MONITOR: ECOM 71-0191-F DESCRIPTIVE NOTE: TASK:

## UNCLASSIFIED REPORT

3 batteries, Lithium, Cathodes, Vanadium compounds, Sulfur oxides, Oxides, Corrosion, Hermetic seals, Electrochemistry, Safety valves, Sealed systems, Fabrication, Fluorides, Performance tests, Radio equipment, Detectors, Anodes IDENTIFIERS: \*Lithium cells, Organic batteries, Vanadium oxides, Design, AN/PRC-25, AN/ DESCRIPTORS: \*Primary batteries, \*Low temperature

3

3 initial phase of the contract, the effort resulted in employing vanadium pentoxide as the cathode material. Cell corrosion problems causing random failures and hermetic seal and corrosion problems which precluded delivery of batteries are discussed. Battery test preventing battery delivery to ECOM are discussed.
A battery safety study was also conducted. The second contract phase centered on the fabrication of lithium-sulfur dioxide batteries in the 15 voit BA-5386( )/U configuration for Radio Set AN/PRC-25 and -77 and other electronics applications. of a safety program cc.prised a significant portion of contract effort. Cell leakage through the nonrupture disc) in the cell design and the conducting Lithium-organic electrolyte cells and batteries were developed and fabricated for use in powering sensor and communications equipment. During the Incorporation of a safety venting system (Tefzel the development of a lithium disc cell design, results and post mortem analyses are included.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

LOCKHEED MISSILES AND SPACE CO INC PALO ALTO CALIF PALO ALTO RESEARCH LAB 10/3 AD-A019 580

Analysis of Porous Electrodes with Sparingly Soluble Reactants, IV Application to Particulate Bed Electrode: Ag/AgCl System.

Katan, Theodore ; Gu, Hiram ; DESCRIPTIVE NOTE: Technical rept., JAN 76 32P Bennion, Douglas N.;

REPT, NO. LMSC-D464335, TR-4 CONTRACT: N00014-73-C-0397

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with California Univ., Los Angeles. School of Engineering and Applied Science.
DESCRIPTORS: \*Electrodes, \*Silver chloride, \*Storage batteries, Battery components, Performance tests, Porous materials, Electrical conductivity, Polarization, Electrochemistry IDENTIFIERS: \*Silver cells

33

processes affecting performance of totally-immersed, Experiments were conducted to characterize critical behavior under galvanostatic conditions determined experimentally are in good accord with a recently developed mathematical model. porous, secondary electrodes. Reaction product (AgC1) distribution and polarization-time

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PAGE

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

19/5 10/3 HUGHES AIRCRAFT CO CULVER CITY CALIF LASER DIV AD-A019 511

Lightweight Laser Designator Battery Evaluation Tests.

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DESCRIPTIVE NOTE: Final rept., FEB 74 86P Dahlinger, R. J.; REPT. NO. HAC-Ref-C5104, HAC-P74-181 DAAB07-72-C-0264 CONTRACT:

## UNCLASSIFIED REPORT

3 3 DESCRIPTORS: \*Nickel cadmium batteries, \*Silver zinc batteries, \*Laser target designators, Performance IDENTIFIERS: Lightweight laser designator battery Availability: Available in microfiche only. tests, Electric batteries, Lithium, Sulfur system

Three battery systems were selected for the second phase of the program (cell characterization): lithium-sulphur dioxide, silver-zinc, and nickel-cadmium. During Phase II, the LWLD load was simulated, and the capabilities of the three battery systems were characterized on a single-cell basis. During the single-cell testing, the lithium-sulphur consideration. During Phase III, multi-cell systems of the silver-zinc and nickel-cadmium batteries were tested with the LWLD breadboard as a battery system were defined and compared with the characteristics of all possible candidate systems During Phase I, the chiracteristics required by the Lightweight Laser Designator (LWLD) dioxide system was eliminated from further

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMD7 DDC REPORT BIBLIDGRAPHY

PADIAN CORP AUSTIN TEX AD-A019 480

State of Charge Determination for Aerospace Batteries.

3

Jones, David C. ; DeBerry, DESCRIPTIVE NOTE: Final rept. Oct 73-Aug 75, David W.; Clark, William Shelton; CONTRACT: F33615-74-C-2005 PROJ: AF-3145 OCT 75 121P

TR-75-83 MONITOR: AFAPL

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, \*Silver zinc batteries, Electric charge, Determination, Aerospace systems, Test methods, Test equipment DESCRIPTORS:

IDENTIFIERS: Battery testers

33

and to detect the presence of weak or defective cells. A constant voltage discharge pulse test was developed to determine if a zinc-silver oxide battery was charged above 80-85% of full capacity. investigated as methods for determining the state-of-charge of nickel-cadmium and zinc-silver oxide state-of-charge range for nickel-cadmium batteries was deveroped on the basis of a constant voltage discharge pulse and a preconditioning step. The effects of temperature, cycling, and cell variations on test results were determined. The procedure was shown to be able to test cells of unknown background batteries. An accurate indicator over the whole High current, short duration pulses were

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

PENNSYLVANIA UNIV PHILADELPHIA DEPT OF CHEMICAL AND BIOCHEMICAL ENGINEERIN 10/3 4D-A018 852

3 Lithium Sulfury! Chloride Battery.

DESCRIPTIVE NOTE: Semi-annual rept. 1 Dec 74-31 May

Nanis, Leonard ; Kapur, Vijay K. ; Huang, Maoyao ; Gencer, Mehmet Ali ; CONTRACT: DAAB07-75-C-1676 PROJ: DA-1-S-762705-AH-94 TASK: 1-S-762705-AH-94-P-1 33P OCT 75

MONITOR: ECOM 75-1676-1

## UNCLASSIFIED REPORT

DESCRIPTORS: \*Primary batteries, Electrochemistry, Ionic current, Electrolytes,
Cathodes(Electrolytic cell),
Anodes(Electrolytic cell), Thionyl chloride,
Phosphorus compounds, Electrical conductivity,
Calibration, Solutions(Mixtures), Electrical
resistance, Performance tests, Solvents, Lithium

 $\widehat{\Xi}$ IDENTIFIERS: \*Lithium-sulfur batteries, Sulfuryl chloride, Phosphoryl chloride

3 was obtained. Accumulation of reduction products on the carbon cathode decreased the life of the cell. order to avoid frequency dependent impedance behavior electrolyte in a battery with a lithium metal anode conductivity measurement method has been devised in conductance measurement. Discharge characteristics of the cell Li/LiAIC14(2.5M)~S02C12/ 25C was found to be 5 plus or minus 2 X 10 to the and a carbon cathode. A preliminary conductivity at electrodes and to improve the precision of C were studied. Open circuit voltage of 3.96V -3 power Ohm/cm. A simple four point probe Replacement of the cathode renewed cell value for LiAIC14 (2.5M) in S02C12 at LiAiCi4 in S02C12 was used as the

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB 10/3 AD-A018 517

Fabrication and Investigation of Nickel-Alkaline Cells. Part 1. Fabrication of Nickel-Hydroxide Electrodes Using Electrochemical Impregnation Techniques.

DESCRIPTIVE NOTE: Technical rept. 1 Jan 71-1 Jan 74, Pickett, David F.;

REPT. NO. AFAPL-TR-75-34-Pt-1 PROJ: AF-3145

TASK: 314522

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Part 2 dated Oct 75, AD-A018 478.

batteries, \*Storage batteries, Impregnation, Electrodes, Solutions(Mixtures), Cobalt, Porous materials, Performance(Engineering), DESCRIPTORS: \*Fabrication, \*Nickel cadmium

Deposition, Temperature IDENTIFIERS: Nickel hydroxide electrodes,

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3 3

\*Plaque (Metals), \*Battery electrodes

capacities as high as 9.5 ampere-hours per cubic inch and improved cycle life at high temperatures and deep Several electrochemical impregnation techniques for various techniques has been performed using 20-50% overcharge for 10-30 cycles. Some electrodes show using cadmium electrodes fabricated from another electrochemical technique. These cells show vastly range, over state-of-the-art vented aircraft cells after these cycles. The alcohol process has been scaled to pilot production, and several 20-25 A-H vented Nickel-Cadmium cells were constructed improved charge acceptance, at a wide temperature nickel sinters have been investigated. The most favorable means of impregnation appears to be Formation cycling of electrodes made from the deposition of active Nickel-Hydroxide inside deposition from alcoholic nitrate solutions.

UNCLASSIFIED

AD-A018 517

depths of discharge.

ZOMO2 SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB 35-A018 478

Fabrication of Nickel Hydroxide Electrodes. Alkaline Cells. Part II. Analysis of Ethanolic Metal Nitrate Solutions Used in Fabrication and Investigation of Nickel-

DESCRIPTIVE NOTE: Technical rept. Jun 72-Jan 75, Pickett, David F. ; REPT. NO. AFAPL-TR-75-34-Pt-2 20P 75

### UNCLASSIFIED REPORT

3 3 SUPPLEMENTARY NOTE: See also Part 1 dated Oct 75, \*Nickel cadmium batteries, Electrodes, Solutions(Mixtures), Cobalt, Porous materials, Nitrogen oxides, Gas chromatography, Ethanols, \*Storage batteries, \*Electrodes, Electrodeposition IDENTIFIERS: Nickel hydroxide electrodes, \*Plaque(Metals), \*Battery electrodes AD-A018 517. DESCRIPTORS:

electrodeposition of nickel and cobalt hydroxides inside nickel sinters (D.F. Pickett, U.S. Patent 3,827,911 (1974)). Nickel hydroxide electrodes, resulting from this technique, have chromatography, atomic absorption spectrophotometry, and visual spectrophotometry for individual component impregnating solutions have been developed. These demonstrated superior performance over electrodes Conference San Francisco, CA, Aug 1974, pp. 873-879). In order to control quality of these new electrodes several methods of analysis for Ethanol solutions containing nickel and cobalt commonly used in aerospace Ni-Cd batteries (V. J. Puglisi, H. N. Seiger, and D. F. Pickett, Proceedings of the 9th IECEC methods employ use of techniques such as gas

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N 10/3 AD-A017 117

Investigation of New Cell Components for Vented Nickel-Cadmium Batteries.

3

Wagner, Otto C. DESCRIPTIVE NOTE: Technical rept., NOV 75 20P WE REPT. NO. ECOM-4364 PROJ: DA-1-S-762705-AH-94

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1-S-762705-AH-94-P-2

TASK:

# UNCLASSIFIED REPORT

components, Anodes, Membranes, Recrystallization, Degradation, Reliability(Electronics), Indium compounds, Additives, Polyethylene, Battery \*Nickel cadmium batteries, \*Battery DESCRIPTORS:

IDENTIFIERS: Cellophane, Indium hydroxides, Separators

3 3

Methacrylic acid

cells (-20F) with methacrylic acid-grafted polyethylene membranes, E-2291 (40/20), is equal to that of cells with standard cellophane membranes if the former are initially formed by means nickel-cadmium batteries shows that it is possible to prevent capacity loss due to crystal growth of cadmium and cadmium hydroxide by the addition of 1% about five times greater than standard batteries with found to be partially effective in resisting crystal growth. The investigation also shows that the low temperature performance of vented nickel-cadmium An investigation of new cell components for vented nickel-cadmium batteries with E-2291 separator is of an optimized pulse mode of charging (based on indium hydroxide to the active cadmium powder. Cadmium anodes with 5% nickel hydroxide were USAF data, the room temperature life of vented

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cellophane membranes).

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

Charge-Discharge Cycling of DREO Air Electrodes,

3

Armstrong, William A. SEP 75 19P REPT. NO. DREO-R-728

# UNCLASSIFIED REPORT

3 3 Cathodes(Electrolytic cell), Nickel, Porous materials, Silver, Electrocatalysts, Oxygen, Zinc, Air, Mercury, Tetrafluoroethylene resins, Reliability(Electronics), Canada IDENTIFIERS: Zinc air cells, Metal air batteries, DESCRIPTORS: \*Storage batteries, Battery electrodes

3 surface in contact wit: the electrolyte on the ability of an air cathode to withstand the rigours of the lowest oxygen evolution potential. With a cycle regime consisting of 1 h oxygen reduction at 26 mA/sq cm followed by 2 h oxygen evolution at the same investigated. Of the compositions studied, a sintered nickel surface containing silver, mercury current density, the oxygen reduction potential decreased by 156 mV during 41 cycles. The effects of the composition of the electrode and PTFE (polytetrafluoroethylene) exhibited oxygen evolution during charging have been

### UNCLASSIFIED

SEARCH CONTROL NO. 20MO7 DDC REPORT BIBLIOGRAPHY

AD-A016 643

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) Lithium Batteries - An Overview.

3

Nagy, G. D. DESCRIPTIVE NOTE: Technical note, 26P

UNCLASSIFIED REPORT REPT. NO. DREG-TN-74-29

DESCRIPTORS: \*Primary batteries, \*Storage batteries, Meetings, Lithium, Electrolytes, Electrodes, Halides, Oxides, Hazards, Reviews, Canada IDENIFIERS: High energy batteries, \*Lithium

3 3

3 commercial batteries has demonstrated the viability of lithium systems. This paper reviews some of the lithium systems have always been prime candidates because of thier low equivalent weight and high potential. Problems have been concerned with handling and efficient utilization of the active components. The recent advent of promising In the search of high-energy density batteries, promising systems and their problems.

AD-A016 721

PAGE

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

EAGLE-PICHER INDUSTRIES IN JPLIN MO ELECTRONICS DIV AD-A016 468

Low Rate Lithium Batteries 10r ECM Expendables.

3

DESCRIPTIVE NOTE: Final rept. 21 May 73-21 Jul 75, JUL 75 128P Higgins, Robert L.; CONTRACT: F33615-73-C-2061

PROJ: AF-3145

MONITOR: AFAPL

TR-75-63

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Primary batteries, Electronic countermeasures, Electrodes, Clathrate compounds, Electrolytes, Fluorides, Prototypes

3 IDENTIFIERS: \*Lithium cells, Graphite fluorine clathrates, Carbon monofluoride, Lithium fluoride, Lithium graphite fluoride cells, Design

3 of four Li/CF batteries. A 28 volt, 10 amperemindte battery weighing less than 4 ounces was fully developed, produced and evaluated. The three remaining designs were developed and tested in breadboard configurations. Fully developed battereis were tested at temperatures from -50F to This report describes the development and testing 165F. Results are discussed.

### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

-4016 458 10/3 7/4 17/4 LOCKHEED MISSILES AND SPACE CO INC PALO ALTO CALIF AD-A016 458

Advanced Lithium-Water Battery for Electronic Countermeasure Devices.

3

DESCRIPTIVE NOTE: Final rept. 1 Nov 73-1 Feb 75, Bauman, H. F. ;

FEB 75 80P Bai NO. LMSC-D409491 NACT: F33615-73-C-2021 REPT. NO.

TR-75-39 CONTRACT:

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also report dated 26 Nov 73, AD-778 825.

DESCRIPTORS: \*Primary batteries, Lithium, Water, Electrochemistry, Electrolytes, Temperature, Alkaline batteries, Anodes,

Cathodes(Electrolytic cell), Ammonium compounds, Fluorides, Hydrogen peroxide, Electrical conductivity, Efficiency, Lithium alloys, Breadboard models
IDENTIFIERS: \*Lithium water cells, \*Lithium hydroxide, Ammonium fluorides, Design

3 3

> less than design current because of flow equalization The objective of this effort is to provide advanced cells resulted in constant voltage discharges. Libattery technology leading to improved primary battery power supplies for Air Force applications. Anode alloys and cathode geometry were evaluated in lithium-water cells. The use of H2D cells in breadboard configuration discharged in excess of 45 min. at 1.2 V at 2A/sq in. Li cells with H202 as cathode reactant delivered 45 utilization efficiency was greater than 70%. Li min. of discharge at 2.5 V and 2A/sq in. Breadboard batteries discharged at 24 V but at NH4F as a precipitant of LiOH in Li-water

3

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UNCLASSIFIED

AD-A016 468

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. 20MO7

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD-A016 132

3 Investigation of Charging Methods for Nickel-Cadmium Batteries.

DESCRIPTIVE NOTE: Technical rept., SEP 75 16F wagner,Otto C.;Williams, Dorothy D. :

REPT. NO. ECOM-4355 PROJ: DA-1-5-762705-AH-94

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, Battery chargers, Electrochemistry, Control, Discharge, Performance(Engineering)

3

3 difference in charge acceptance between the pulse and constant current d.c. charging modes in a temperature range of -20F to about +100F. Above +100F rate for both charge modes, while at temperatures cadmium batteries employed in this study. Memory, phenomenon due to the formation of alpha-type nickelic oxide in the nickel cathodes of vented nickel-cadmium batteries, can be erased by occasionally draining the battery to about 0 volt per cell at the C/10 rate. Sealed nickel-cadmium batteries, each battery consisting of five 4.0 Ah D cells manufactured by General Electric Company, showed little C/10. Charge control by a pressure switch developed by General Research Laboratories proved to be highly pressure switch developed by General Research Laboratories proved to be highly practical for the sealed D-type nickelmaximum charge acceptance is attained at the 2C below +40F the charge rate should be as low as

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) 10/2 10/3 AD-A015 868

A Pressed-Sintered Silver Chloride Cathode,

3

Powell, P. J. ; Nagy, G. D. AUG 75 18P

REPT. NO. DREO-724

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Abstract in French. DESCRIPTORS: \*Electrodes, \*Primary batteries, \*Sea water batteries, \*Reserve batteries, \*Cathodes(Electrolytic cell), Metals, Silver IDENTIFIERS: AN/URT-503, Magnesium silver chloride cells chloride, Canada

3 3

A new silver chloride electrode has been developed for use in metal-silver chloride batteries, capable of operating over a wide temperature range (-40 C to +145 C). The method of manufacturing such an electrode involves the use of a mixture containing 90% AgCI and 10% Ag20, which is pressed with some of the advantages of such an electrode as they are related to a low-rate battery application Onto a silver grid and sintered. This report deals (2 mA/c sq cm). (Author)

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AD-A015 868

20

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UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

GOULD INC ST PAUL MINN ENERGY RESEARCH LAB AD-A015 520

R and D for Hybrid Sattery and Cell Studies.

Ξ

Christianson, Clinton C. ; DESCRIPTIVE NOTE: Final rept. 1 Apr 73-15 Apr 75, Menard, Claude J. : Rubischko, Richard J. ; AUG 75 104P

Thimmesch, David M. : NTRACT: DAABO7-73-C-0127 DJ: DA-1-S-762705-AH-94 CONTRACT:

ECOM 73-0127-F PROJ: DA

# UNCLASSIFIED REPORT

3 ESCRIPTORS: \*Primary batteries, \*Storage batteries, Reliability(Electronics), Nickel cadmium batteries, Circuits, Zinc, Lithium, Mercury batteries, Manganese, Temperature, Hybrid systems, DESCRIPTORS:

3 Organic batteries, Mercury zinc cells, Manganese zinc cells, Magnesium manganese oxide cells, IDENTIFIERS: Zinc air Calls, Lithium cells, Battery charging

3 Zn-HgO, and Mg-MnG2 cells with cell performance being characterized over a temperature range of -40 to 140F and a load current range of C/250 to C/5. Highest energy density was obtained from the zinc-air and Li-organic cells with the zinc-air cells showing superior energy density at temperatures above 0F and the Li-organic cells giving better performance at temperatures below 0F. Energy density, voltage and capacity data are presented for the primary and Charge Control Development. The primary battery investigation covered zinc-air, Li-organic, developed and is described. Secondary performance data indicates that hybrid operation, at dischange and charge rates of 6C and 1C, respectively and previously indicated. A high-rate low temperature cell temperatures as low as 10F, will be possible Three areas of work are described. These are the Primary Battery Investigation, the Secondary Battery Investigation, and the System Design systems over the temperature and load range without parasitic heaters.

### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

EAGLE-PICHER INDUSTRIES INC JOPLIN MO AD-A015 018

New Mechanically Rechargeable Zinc-Air

DESCRIPTIVE NOTE: Final rept. 15 Apr 73-30 Apr 75, Batteries.

3

Giltner, John ; AUG 75 48P Gi CONTRACT: DAABO7-73-C-0149 PROJ: DA-1-G-763702-DG-10 TASK: 1-G-763702-DG-10-01

MONITOR: ECOM 73-0149-F

# UNCLASSIFIED REPORT

ESCRIPTORS: \*Electric batteries, Zinc, Reliability(Electronics), Life tests, Silver alloys, Mercury alloys, Cathodes, Catalysts, Prototypes, Anodes IDENTIFIERS: \*Zinc air batteries, Design, DESCRIPTORS:

Battery recharging

3 3

This report describes the design, development and

low cost silver-mercury cathode catalyst, prototype testing of new mechanically rechargeable zinc-air batteries. Following research and development of a plexiglass cases with 22 series - connected cells. through at least 26 cycles when this test was terminated for the final hardware build. The cathode bi-cell design utilized the 75 AH plastic frames which were cut down in height and width. Woven-zinc anodes were tested during the program, but were found to operate at reduced voltage and efficiency. The final anode design was a dry pressed composition of zinc, KOH, and HgO and battery rests were conducted. Cycle life tests at indicated a very good efficiency at 3.5 amperes. 3.5 amperes indicated satisfactory performance Final batteries were delivered in fabricated

Discharge tests were conducted on nine (9) of

the ten (10) delivered batteries.

AD-A015 018

UNCLASSIFIED

AD-A015 520

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

DOW CHEMICAL U S A WALNUT CREEK CALIF 10/3 AD-A014 474

Research and Development in the Glass Fiber Sodium-Sulfur Battery.

3

DESCRIPTIVE NOTE: Annual technical rept.,
JUN 75 25P Levine, Charles A.;
CONTRACT: DAHC15-73-C-0254, ARPA Order-2381

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also report dated 31 Dec 74, \*Storage batteries, Fiberglass, Reliability(Electronics), Life fibers AD-A008 849. DESCRIPTORS: Fabrication,

\*High energy batteries, \*Sodium tests, Glass IDENTIFIERS:

3

3

authors have been able to separate those factors that to have outstanding electrochemical characteristics. The major problem is to obtain increased lifetimes observing the mode of failure of operating cells the the hollow fiber sodium-sulfur cell has been shown cause shortened lifetime into several categories. They include: (1) glass fiber weakening at the tube sheet due to reaction with the tube sheet and still maintain the good performance. By

assemblies have been built in which degradation from in which they can change the quality of the sodium anolyte, the current density, and the number of column volumes of sodium charged or discharged per that puts excess strain on parts of the cell; and, (3) degradation of the fiber itself as a function of its electrochemical environment. Small material; (2) mechanical configurations or damage occurring on the sulfide side of the cell. These assemblies allow the authors to run Na-Na cells the sodium side can be isolated from degradation

3

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT 10/3 AD-A014 337

-A014 337 10/3 1/3 AIR FORCE AERD PROPULSION LAB WRIGHT-PATTERSON AFB

Evaluation and Improvement of a Sealed Battery System for Aircraft.

3

DESCRIPTIVE NOTE: Final technical rept. Nov 71-Jul 74, APR 75 61P McWhorter, Ted A.; APR 75 61P M REPT. NO. AFAPL-TR-74-82 PROJ: AF-3145

314522 TASK:

# UNCLASSIFIED REPORT

\*Nickel cadmium batteries, Aircraft equipment, Power supplies, Electrolytes, Maintenance, Compatibility, Flight testing, Reliability, Life expectancy, Electronic commutators, Logic devices, Bus conductors, Cycles, Voltage regulation, Battery chargers, Power transformers, Rectifiers, Failure, Sealed systems, Electric power IDENTIFIERS: B-52 aircraft, C-135 aircraft, KC-135 aircraft, UH-1F aircraft, H-1 aircraft DESCRIPTORS:

3 3

3 compatibility and performance in B-52H, C-135, KC-135 and UH-1F aircraft. Modifications were made to the battery system, as necessary to achieve free battery system was experimentally demonstrated. It is recommended that further work be undertaken to establish a reliable, long term system. satisfactory performance. Flight test results are presented. General compatibility and good performance of the first version of the maintenance A sealed nickel cadmium battery with an integral power conditioning package called a Maintenance Free Aircraft Battery was evaluated for

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

EAGLE-PICHER CO JOPLIN MO COUPLES DEPT AD-A014 066

Non-Hazardous Primary Lithium Organic Electrolyte Batteries.

3

DESCRIPTIVE NOTE: Final rept. 20 Jun 73-30 Mar 75, Jul. 75 50+ Giltner, J.; DAAB07-73-C-0269 ECOM 73-0269-F CONTRACT: MONITOR:

# UNCLASSIFIED REPORT

3 ESCRIPTORS: \*Primary batteries, \*Hazards, Lithium, Test methods, Heat, Ventilation, DESCRIPTORS: Safety

3 Design, \*Lithium cells, Organic DENTIFIERS: batteries

safe under various severe conditions of storage, use This report describes the design and testing of the BA-5590()/U which is a primary, lithium-organic electrolyte battery. The intent of the program is the development of a battery which will be rendered and disposal.

### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

AD-A013 519 13/2 10/3
ARMY NATICK DEVELOPMENT CENTER MASS CLOTHING EQUIPMENT AND MATERIALS ENGINEERING LAB

Disposal of Spent Batteries and the Feasibility of Reclaiming Their Components.

3

Szlachtun, Andrew J. ; TR-75-74-CEMEL DESCRIPTIVE NOTE: Final rept., MAY 75 42P Szlach REPT. NO. CEMEL-145 PROJ: DA-1-T-162105-AH-84 TASK: 1-T-162105-AH-8410 USA-NLABS MONITOR:

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Waste disposal, \*Dry batteries, Solid wastes, Earth fills, Water pollution, Leaching, Earth fills, Heavy metals IDENTIFIERS: \*Solid waste disposal, Sanitary landfills, Zinc cells

3 3

> periodically over the burial site and the leach was analyzed for heavy metal ion concentrations by means of atomic absorption spectroscopy. Test data and industry contact show that there is no serious bollution problem associated with the disposal of carbon-zinc dry cell batteries other than their bulk. The batteries should be disposed of along with quantities of batteries are discarded, they should be buried at a site that is well drained, above the ground water table, and in calcareous earth or in areas amended with lime. Recycling of dry cell batteries was found to be economically unfeasible at loam and in sand, and in acidic and near neutral to other trash, in sanitary land fills. When large Spent and new dry cell batteries were buried in slightly basic conditions. Water was poured this time.

3

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

BOSE CORP FRAMINGHAM MASS AD-A013 364

Battery Charger PP-4126( )/U.

3

DESCRIPTIVE NOTE: Final rept. 1 Jul 71-Jun 74, Jul 75 97P Froeschle, T. A.; CONTRACT: DAAB07-71-C-0355 PROJ: DA-1-G-764717-D-5896

UNCLASSIFIED REPORT

MONITOR: ECOM 71-0355-F

\*Battery chargers, \*Nickel cadmium batteries, \*Silver zinc batteries, Seals(Stoppers), Vents, Voltage, Efficiency, Logic circuits, Electric power, Performance(Engineering) DESCRIPTORS:

3

the PP-4126( )/U Battery Charger are delineated in this final report. Performance of the The performance data and design configuration of

3 components used to implement the systems blocks are identified. The PP-4126( )/U Battery Charger is designed to charge 6, 12, and 24 Vdc batteries at selectable charging rates from 0.1 Ado a finned housing with a removable cover. The cover Functions of internal system blocks are discussed unit is summarized. Terminal performance and selected aspects of internal performance are considered. The internal system configuration of the battery charger is presented in block form. Vdc to 40 Vdc. The battery charger structure is to define their design and behavior. Circuit to 12 Adc. The battery charger operates from MIL-STD-704 dc power sources in the range 22 contains the input power cable. The battery charger may be operated in any position.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

HUGHES AIRCRAFT CO EL SEGUNDO CALIF SPACE AND COMMUNICATIONS GROUP

Nickel Hydrogen Energy Storage for Satellites.

3

DESCRIPTIVE NOTE: Supplement to Final rept. Dec 74-Levy, E. . Jr.; Rogers, H.

878 74

CONTRACT: F33615-73-C-2064 PROJ: AF-3145 TASK: 314521

TR-74-111-Suppl-1 MONITOR: AFAPL

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Supplement to report dated Nov 74,

\*Storage batteries, \*Spacecraft DESCRIPTORS:

components, Satellites(Artificial), Reliability(Electronics), Nickel, Hydrogen, \*Nickel hydrogen batteries Fest methods DENTIFIERS:

33

pineapple-slice design boilerplate cells. Detailed report. An Appendix which discusses selection of material for the nickel-hydrogen battery pressure The purpose of this supplement is to report additional test data on Tyco 50 A-hr boilerplate cells, cycle and capacity test results on Eagle-Picher 20 A-hr 'prismatic' cells and 50 A-hr test data are presented and interpreted in this vessel is also provided.

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AD-A012 303 74

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AD-A013 364

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

)-4012 098 10/3 7/4 Stanford univ Calif Center for Materials Research

Solid Electrolyte Battery Materials.

DESCRIPTIVE NOTE: Technical rept., MAR 75 187P Huggins, Robert A. REPT. NO. CMR-75-10, TR-4 REPT. NO. CMR-75-10, TR-4 CONTRACT: N00014-67-A-0112-0075 PROJ: NR-056-555

# UNCLASSIFIED REPORT

See also report dated 31 Mar 74, SUPPLEMENTARY NOTE:

Germanates, Clathrate compounds, Crystal defects, Tunneling(Electronics), Activation energy IDENTIFIERS: Lithium silicates, Lithium aluminosilicates, Intercalary compounds, Lithium titanates, Lithium germanates, Graphite fluorine DESCRIPTORS: \*Battery components, \*Storage batteries, \*Solid electrolytes, Alkali metal compounds, Alumina, Graphite, Ions, Ionic current, Cellulosic resins, Lithium compounds, Silicates, Electric conductors, Titanates, clathrates

3

3

3 rutile structure using a minimum energy path model; titanate and lithium germanates; Graphite intercalation compounds; Calculation of motional activation energies for interstitial ions in the ;Contents: Oxide fabrication via controlled oxidation of polymer precursors; The electrical response of some lithium silicates and aluminosilicates; Ramsdellite structure lithium Publications and presentations related to this program.

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

-A011 995 DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) Nickel/Cadmium Aircraft Batteries: AD-A011 995

Thermal Considerations,

3

Feldman, Keiva ; Haines, Ronald APR 75 26P F L.;LePage,William A.; REPT. NO. DREO-R-718

3

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, \*Thermal properties, Thermal degradation, Cooling, Battery separators, Oxygen, Aircraft, Canada IDENTIFIERS: Battery charging

33

batteries are serious due to effects on battery life and safety of operation. In this study theoretical heating takes place during high rate discharges and reviewed and confirmatory experiments were carried out. It was found that when nickel/cadmium place but the reverse is true at high rates. Rapid also during overchange if the separator materials permit oxygen to reach the negative plate. Magnitudes involved are illustrated by typical batteries are charged at low rates cooling takes background of battery heating and cooling was Thermal problems in nickel/cadmium aircraft

3

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A011 027 7/4 10/3
DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

Studies Related to the Low Temperature Recharge of the Lead-Acid System.

3

DESCRIPTIVE NOTE: Technical note,
JAN 75 23 Gardner, Christopher L.;
Rocheleau, Francois;
REPT. NO. DREO-TN-75-1

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Lead acid batteries, Electrodes, Temperature, Sulfuric acid, pH factor, Concentration(Composition), Canada IDENTIFIERS: \*Battery charging, Lead oxides

33

A study has been made of the effects of temperature and sulphuric acid concentration on the formation of persulphuric acid at a lead dioxide electrode and also the recharge properties of the electrode. The effect of electrolyte pH has also been examined. Based on these results some conclusions have been drawn as to the nature of the low temperature recharge problem of the lead-acid battery.

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A009 784 10/3 HONEYWELL INC HORSHAM PA POWER SOURCES CENTER Reserve Low Temperature Lithium-Organic
Electrolyte Battery.

DESCRIPTIVE NOTE: Final rept. Apr 73-Mar 74,
FEB 75 88P Walk,C. Richard;
CONTRACT: DAAB07-73-C-0140
PROJ: DA-1-G-763702-DG-10
TASK: 1-G-763702-DG-1101
MONITOR: ECOM 73-0140-F

3

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Reserve batteries, \*Battery components, Reliability(Electronics), Electrolytes, Cathodes, Lithium compounds, Vanadium compounds, Borates, Fluorine compounds, Actuators IDENTIFIERS: Design, \*Lithium cells, Lithium tetrafluoroborates, Vanadium oxides

3

A 750 mAH reserve low temperature lithium-organic electrolyte battery along with a unique activation mechanism was manufactured and packaged as a single unit. The development phase of the contract culminated with the preparation of a Preliminary Design and Visualization Plan (PDVP) which demonstrated the capabilities of the units. Abuild of 135 units followed approval of the PDVP. Thirty-five units were tested by Honeywell and 100 units were delivered to the U.S. Army Electronics Command. Problems encountered and improvements made during development, manufacture and test of the units are discussed.

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16

AD-A009 784

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB 20/12 AD-A009 145

3 Solid Electrolytes and Photoelectrolysis.

DESCRIPTIVE NOTE: Semiannual technical summary rept. 1 Goodenough, John B. ; Dwight Kirby , Jr.: Hong, Henry Y-P ; Kafalas, James Mar-31 Dec 74,

A. ; Mavroides, John G. ; CONTRACT: F19628-73-C-0002, DARPA Grder-2696 TR-75-108 ESD MONITOR:

UNCLASSIFIED REPORT

Antimonates, Potassium compounds, Sodium compounds, Titanium oxides, Water, Electrodes, Catalysis, Semiconductors, Quantum efficiency, batteries, \*Electrolysis, Sodium, Sulfur, Battery components, Reliability(Electronics), DESCRIPTORS: \*Solid electrolytes, \*Electric antimonates, Sodium fluoride, Sodium sulfur Crystal structure, Phot. lysis, Transport properties, Fluorides, Electrochemistry (DENTIFIERS: Potassium antimonates, Sodium

approximately equal 610 ohm-cm is the best that has powders as the working photocatalytic electrode for achieving photoelectrolysis of water. Ti02 was percent theoretical density give a Na+-ion resistivity at 300C of rho 300 approximately equal 13 ohm-cm and an activation energy E sub a approximately equal 0.35 eV. Preliminary investigations of alumino-silicates having the carnegieite structure show promise, but a rho 300 solid ejectrolytes in Na-S batteries. The cubic KSbO3 structure consists of an (SbO3)been achieved to date. ine authors investigated the use of inexpensive, n-type hot-pressed Ti02 Three classes of cubic skeleton structures are explored for fast Na+-ion transport for use as skeleton having <111> tunnels intersecting at interface with water, evolves 02 and does not origin and body-center positions. NaSb03 and NaSb03.(1/6) NaF disks of ca. 95 selected because it is the lowest gap n-type semiconductor that, under illumination at an decompose.

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ORDNANCE RESEARCH INC FORT WALTON BEACH F'A 10/3 AD-A009 116

Battery Charger PP-7041().

3

DESCRIPTIVE NOTE: Final rept. 30 Apr 74-31 Jan 75, Griffin, Floyd S. ; 31P

APR 75 31P Gri CONTRACT: DAAB07-74-C-0375 PROJ: DA-1-S-733401-D-491 TASK: 1-S-733401-D-49119

MONITOR: ECOM 74-0375-F

UNCLASSIFIED REPORT

\*Battery chargers, \*Nickel cadmium batteries, Power, Circuits. Reliability(Electronics), Test methods, DESCRIPTORS:

Design IDENTIFIERS: Fabrication

33

This report describes the final design of the PP-7041( )/U Battery Charger, which is comprised of three major functional subsystems:

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units were evaluated through operational performance tests, environmental (temperature) tests, and bench handling tests which are summarized in this Section. Nine prototypes were fabricated and two report. The objectives of the program were achieved; the PP-7041( )/U Battery Regulated Power Supply, Charging Section (10 channels), and Discharge/Analyzer

3 Charger was designed and qualified to meet the requirements of the Technical Guidelines and referenced military specifications and standards.

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AD-A009 145

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AD-A009 116

SEARCH CONTROL NO. ZOMO7 BASK REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/3

190 800W

A State-of-Charge Fest for Zinc-Mercuric Gaide Primary Cells.

Winter, John J. ; Breslin, James T. ; Ross, Raymond L. ; Leupold, Herbert 101.10.73.20-04-01 DESCRIPTIVE NOTE: Technical rept., DA-1-T-161102-A-34-A TASK: 1-T-161102-A-34-A-02 A. ; Rothwarf, Frederick; MAR 75 32P MONITOR: GIDEP PROJ:

### UNCLASSIFIED REPORT

Reliability(Electronics), Test methods, Voltage, Electric current, Zinc, Mercury, Measuring instruments, Electric charge, \*Primary batteries, IDENTIFIERS: \*Mercury zinc cells Polarization

33

at different sampling currents and frequencies, and the discharge-time characteristics of the cells as a function of charge expended have been made and are constitutes a useful, easily applied state-of-charge technique to determine the state of charge of zinc-mercuric oxide primary cells has been developed and AC impedance, the electronically sampled derivative A readily instrumented and conducted nondestructive preliminary results obtained. Measurements of the current vs voltage (1-V) characteristics, the reported. The nearly constant slopes of the 1-V curves above 75 mA were measured graphically. These studies indicate that this technique

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DUC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/3 AD-A008 948

Engineering Evaluation of Thermal Insulation of Magnesium-Manganese Dioxide Dry Battery Performance.

3

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DESCRIPTIVE NOTE: Research and development rept., Wood, Donald B. ; 101.10.00.20-04-01 REPT. NO. ECOM-4302 PROJ: DA-1-S-762705-AH-94-P TASK: 1-S-762705-AH-94-P-102 ECDM-4302 17P GIDEP APR 75 MONITOR:

### UNCLASSIFIED REPORT

Manganese oxides, Thermal insulation, Polyurethane IDENTIFIERS: \*Magnesium manganese oxide cells DESCRIPTORS: \*Primary batteries, Magnesium, resins, Reliability(Electronics), Dry batteries

33

dioxide (Mg/MnD2) dry battery performance were obtained by thermally insulating the battery to retain the heat evolved during discharge. The influence of discharge temperature at 130F and discharged at a constant 5 Watt drain at operating temperatures varying from minus 25 to olus 160F. Performance data are presented for Magnesium Battery BA-4840/U, with and without insulation, assessed relative to 74F capacity of individual cells is assessed relative to 74F capacity between the 25 and 100 hour discharge rate. Magnesium Batteries BA-4386/PRC-25 (A2 Section), surrounded by varying thicknesses of thermal insulation, were Substantial improvements in magnesium-manganese and with and without a nickel-cadmium (NiCd) battery in a hybrid configuration.

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

DOW CHEMICAL U S A WALNUT CREEK CALIF AD-A008 849

Research and Development in the Glass Fiber Sodium-Sulfur Battery.

DESCRIPTIVE NOTE: Semi-annual technical rept., DEC 74 23 Levine, Charles A.; CONTRACT: DAHC15-73-C-0254, ARPA Order-2381

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Storage batteries, Fiberglass, Fabrication, Reliability(Electronics), Life SUPPLEMENTARY NOTE: See also AD-782 059.

\*High energy batteries, \*Sodium sulfur cells, Design IDENTIFIERS:

increased lifetimes with the same good performance. The authors want to demonstrate long life (years) with many thousands of charge-discharge cycles in cells that do not change internal heating-cooling characteristics of the cells still The electrochemical characteristics of the hollow fiber sodium-sulfur cell have been shown to be outstanding. The major problem now is to obtain resistance with total time in operation. The must be determined.

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

HONEYWELL INC HORSHAM PA POWER SOURCES CENTER AD-A008 053

Low Cost Water Activated Reserve Battery.

3

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Pollack, M. J. ; DESCRIPTIVE NOTE: Final rept., CONTRACT: N62269-72-C-0117

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Water activated batteries, \*Reserve batteries, Reliability(Electronics), Sea water, Magnesium, Silver chloride, Test methods, Succinimides, Nitrogen heterocyclic compounds IDENTIFIERS: Design, Magnesium cells, Magnesium silver chloride cells, AN/SSQ-53 Electrolytes, Organic compounds, Oxidizers, Sonobuoys, Navigational aids, Melamines,

> 3 3

3 3

> This technical report describes a development program to design and build a low cost, water activated battery. Organic oxidants theoretically attractive for use as cathode materials with magnesium anodes were evaluated and compared with presently used seawater battery systems. Increasing use of seawater activated batteries for chloride cathodes with low cost non-strategic materials. The goal is the ultimate use of such a surveillance buoys has given strong incentive to battery as a replacement in the SSQ-53 sonobuoy. replacement of the conventionally used silver

3

UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A006 748 10/3 7/4 EIC INC NEWTON MASS Passive-Lithium Secondary Batteries. (U)

DESCRIPTIVE NOTE: Final technical rept. 1 Jan 74-31
Jan 75,
FEB 75 8P Rauh, R. David ;Brummer, S.
Barry ;
REPT. NO. C-404-F
CONTRACT: N00014-74-C-0205, ARPA Order-2611
PROJ: NR-359-571

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Storage batteries, \*Lithium,
\*Electrodes, \*Corrosion inhibition, Carbonates,
Acetates, Electrochemistry, Feasibility studies,
Reliability(Electronics), Sulfur oxides,
Water, Esters, Nitromethane, Electrodeposition,
Nickel, Substrates, Lithium compounds
IDENTIFIERS: \*Lithium c'lls, Propylene carbonates,
Acetic acid/methyl ester, Organic batteries,
Propionic acid/methyl ester, Lithium perchlorate,
Lithium aluminum chloride
Lithium aluminum chloride

The purpose of this program has been to explore the feasibility of a unique ambient temperature secondary battery system. This report deals exclusively with rechargeable lithium electrode, which is the major problem area. Specific areas investigated have been the effect of electrolyte composition upon the lithium cycling efficiency, upon the cycle life, and upon the corrosion rate of the electrodeposited material. These variables were studied in three different electrolytic solvents: propylene carbonate (PC) (1), methyl acetate (MA) (2), and methyl pivalate (MP) (3). The electrolytes also contained 1M LiCl04 or 1M LiAlCl4 and, in some experiments, SO2, and methyne or H2C All of the latter additives were found to improve the behavior of the lithium electrode, and were considered as potential precursors. (U)

### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A006 548 10/3 Standard oil CO (OHIO) CLEVELAND RESEARCH AND DEVELOPMENT DEPT Production and Engineering Methods for CARB-TEX (Trade Name) Batteries in Fork Lift Trucks.

DESCRIPTIVE NOTE: Final rept. Jul 73-Dec 74, DEC 74 69P Metcalfe, Joseph E.; CONTRACT: DAAK02-73-C-0493

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also report dated Mar 74, AD-780 940.

DESCRIPTORS: \*Storage batteries, \*Forklift vehicles, Fused salts, Activated carbon, Lithium alloys, Aluminum alloys, Tellunium compounds, Chlorides, Reliability (Electronics), Lithium chloride, Potassium compounds

IDENTIFIERS: \*CARBTEK batteries, Molten salt electrolytes, Tellurium chlorides, Potassium chlorides.

The Carb-Tek battery employs a porous carbon cathode, a lithium-aluminum alloy anode, a eutectic mixture of potassium chloride and lithium chloride as additive. The porous carbon cathode is an aggregation of active carbon particles which have been pressed together with a suitable binder. The Carb-Tek battery employs a solid plate anode which is an alloy of aluminum and lithium. The use of this anode avoids corrosion and other problems associated with operating with liquid lithium anodes. This report describes the production of battery cells in the Sohio battery pilot line. A description of process improvements studies on facilities, cell components is given. Pictures showing presented.

AD-A006 548

3

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#### UNCLASSIFIED

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

ARMY MATERIEL COMMAND TEXARKANA TEX INTERN TRAINING 10/3 13/6 AD-A006 479

Economic Comparison of Four Electric Power Sources for Forklift Trucks.

3

DESCRIPTIVE NOTE: Final rept., A2P Reavis, Daryl D. REPT. NO. USAMC-ITC-02-08-73-213

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Forklift vehicles, \*Storage batteries, Lithium chloride, Lead acid batteries, Fuel cells, Nickel, Iron, Electric Dower, Hybrid systems, Economics, Economic models, Computerized simulation, Computer programs
IDENTIFIERS: Iron nickel cells, Lithium cells, Availability: Available in microfiche only.

Sensitivity analysis

3

3 battery and a fuel cell, currently under development at USAMERDC for use in forklift trucks, with two standard storage batteries, the nickel iron and the lead acid. A universal comparison ratio of present value cost (PVC) per unit of energy delivered is decided upon. An economic model is derived to fit that the lithium chloride battery is the most cost program has been written to simulate the economic life cycle model. The Output histogram of this comparing between power sources. The results show compare two power sources (EPS). Secondly, it is to compare two power sources, the lithium chloride storage battery and a hybrid system of a storage it is to provide a general method of comparing computer simulation provides an easy method of The purpose of this project is twofold. First, the life cycle of the EPS system. A computer effective EPS considered.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) 10/3 AD-A006 447

Studies on Pasted Silver Oxide Electrodes Suitable for a Pile Battery,

3

Allvey, George W. : Hayashi, DRE0-R-704 49P Robert

# UNCLASSIFIED REPORT

Cathodes(Electrolytic cell), Torpedoes, Reliability(Electronics), Silver oxides DENTIFIERS: \*Silver zinc cells, Pile batteries, DESCRIPTORS: \*Primary batteries, IDENTIFIERS:

3 3

of physical characteristics. The test results on small single electrodes were scaled up and indicated possible replacement battery to give some indication high rate discharge characteristics was established. The feasibility of producing cathodes for a torpedo propulsion Ag/Zn primary battery using chemically prepared silver oxide was studied. On a practical basis, work was directed towards a pile type of silver of less than 3.5 g/Ah can meet the replacement battery for the MK NC 46 battery which would require less silver to provide at least the method for preparing AgO plates with acceptable present power and energy densities. A suitable that a pile Ag/Zn battery with total design-Approximate design values were derived for a weight of silver of less than MK NC 46 output requirement.

3

AD-A006 447

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

-A006 427 10/3 22/2 HUGHES AIRCRAFT CO EL SEGUNDO CALIF SPACE AND COMMUNICATIONS GROUP ND-A006 427

Nickel Hydrogen Energy Storage for Satellites.

3

DESCRIPTIVE NOTE: Final rept. 1 Jul 73-31 Oct 74, NOV 74 233P Levy, E., Jr.; Rogers, H. H.; McGrath, R. J.; Wittmann, A.; TR-74-111 CONTRACT: F33615-73-C-2064 TASK: 314521 MONITOR: AFAPL AF-3145 PROJ:

# UNCLASSIFIED REPORT

3 \*Storage batteries, \*Spacecraft components, Satellites(Artificial), Reliability(Electronics), Nickel, Hydrogen IDENTIFIERS: \*Nickel hydrogen batteries, DESCRIPTORS:

Design

3

3 development of lightweight, multiorbit energy storage systems for satellites. The program objective was to use the inherent advantages of nickel-hydrogen cells such as higher energy density, longer life, use of pressure for charge indication and charge control, studies and material tests; and integrating the cells electrochemical performance; pressure vessel material secondary objective was to investigate the use of a common system or common module for both low and synchronous orbit satellites. This was an exploratory development program to define critical design problems and initiate solutions. The program included subcontracting 50 A-hr cells, both boiler plate and lightweight; performing parametric and cycle tests; analyzing thermal, structural, and into spacecraft. The study and test program resulted in a recommended design of a 50 A-hr cell Nork was performed over a 15 month period toward with an estimated flight weight of 2.75 pounds.

### UNCLASBIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMD7

ARMY ELECTRONICS COMMAND FORT MONMOUTH N 13/12 10/3 AD-A006 149

Preliminary Safety Analysis of Lithium

3

Hunger, Herbert F. ; DESCRIPTIVE NOTE: Technical rept., Batteries.

TASK: 1-5-762705-AH-94-P-1 REPT. NO. ECOM-4292 PROJ: DA-1-S-762705-AH-94 FEB 75 43P Christopulos, John A.;

101.80.00.20-04-01 MONITOR: GIDEP

# UNCLASSIFIED REPORT

Datteries, \*Safety, Hazards, Manufacturing, Handling, Storage, Waste disposal, Solid wastes, Explosions, Flammability, Toxic hazards IDENTIFIERS: \*Lithium cells, Hazardous DESCRIPTORS: \*Electric batteries, \*Storage

materials

3

3

the reason for potential hazards, such as explosions fires, and release of toxic chemicals. Suggested conventional batteries, such as high energy content and low temperature operation capability. The high chemical activity of lithium batteries, however, is methods to bring these hazards under control are discussed. Further, safety precautions to be taken by operating personnel and during the fabrication process are outlined. This report covers the safety aspects of lithium batteries from R and D through manufacture, handling, storage, transport, and operation to disposal. Lithium batteries have advantages over

3

AD-A006 149

UNCLASSIFIED

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### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

-A006 093 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE AD-A006 093

State Standards of the USSR, Lead-Acid Automotive Storage Batteries GOST 959.0-71.

FSTC-HT-23-930-74 REPT. NO.

# UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Trans. of Russian State Standard GOST 959.0-71, 1973.
DESCRIPTORS: \*Storage batteries, \*Lead acid batteries, \*Vehicles, Standards, Test methods, Storage, Packaging, Translations, USSR

3 The general specifications of various types of storage batteries are given, as is a breakdown of the arbitrary designation of each of them. A review of state standards for lead starting storage batteries used in heavy vehicles is presented. The standar's show methods in which the batteries must be tested, stored, transported and packed, as well as their general specifications.

### UNCLASSIFIED

SEARCH CONFROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

-A006 084 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE AD-A006 084

Glavanic Cell Manufacturing Method,

3

JUL 74 4P Jammet, Jean Firmin; REPT. NO. FSTC-HT-23-1065-73

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Patent (USSR) 250

Manufacturing, Battery components, Translations, DESCRIPTORS: \*Primary batteries, Patents,

3

3 pressing it and the case, sealing cup and shell through a pressing tube, the diameter of which equals the diameter of the finished cell. The method was developed in order to simplify production technology primary cell by filling its case with active materials, placing a sealing cup on the case bottom, and covering the case and cup with a plastic shell which is then covered with a metal casing. The metal casing is fixed onto the plastic shell by The patent discloses a method of manufacturing a and improve electrical characteristics.

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE 4D-A006 079

3 Effect of the Electrolyte Temperature During Changing of Plates on the Characteristics of Electrodes and Cells of Lead-Acid Automotive Storage Batteries,

Bordt, E. F. : Novoderezhkin, V. V. ; Kudzevich, Z. S. ; REPT. NO. FSTC-HT-23-1000-74 16P

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. from Vsesoyuznyi Nauchno-Issledovatelskii Akkumuliatornyi Institut. Sbornik Rabot po Khimicheskim Istochnikam Toka (USSR) v7

DESCRIPTORS: \*Storage batteries, \*Lead acid batteries, \*Electrodes, Reliability(Electronics). Vehicles, Temperature, Translations, USSR

3

initial electrolyte temperature from 20 to 40 and increasing the process-averaged temperature from 40 to 64 has on the characteristics of electrodes and automotive batteries based on these electrodes. A study was made of the effect that increasing the

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO? DDC REPORT BIBLIOGRAPHY AD-A005 978 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE

An Automatic Charge-Discharge Device Testing Storage Batteries,

3

NOV 74 16P Koshmin, V. P. REPT. NO. FSTC-HT-23-173-75

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Vsesoyuznyi Nauchno-Issledovatelskii Akkumuliatornyi Institut. Sbornik DESCRIPTORS: \*Storage batteries, \*Test equipment, Rabot po Knimicheskim Istochnikam Toka (USSR) n6 p247-254 1971. Automatic, Translations, USSR

3

and discharging various kinds of storage batteries with nominal voltages from 12-24 volts and charge currents up to 1.5 a. Discharge current ranges from 0.5 to 10 a. Charging takes place in two steps: first, charge current is stabilized; then, current decreases while charge voltage is stabilized. The article gives a description of and specifications for AZRU-17-0.8, an automatic charge-discharge device. It is used for charging

3

AD-A005 978

84

PAGE

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE

Cold Storage Battery,

3

74 4P Rudakov, N. S. ; FSTC-HT-23-0342-74

### UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Trans. of Patent (USSR) 340 856, DESCRIPTORS: \*Storage batteries, \*Refrigeration systems, Patents, Cold storage, Translations, USSR

3 The cold storage battery contains a cooling element hermetically sealed vessels Containing a eutectic solution. The coolant passes over the vessels and inside a thermally insulated body. The elements are in the form of a perforated tank filled with the solution in them freezes.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ENERGY RESEARCH CORP BETHEL CONN AD-A005 079

Low Power Metal Hydride Fuel Cell/ Battery Hybrid Systems.

3

DESCRIPTIVE NOTE: Final rept. 15 Jun 73-15 Oct 74, JAN 75 49P Baker, Bernard S. ; Camp,

CONTRACT: DAABO7-73-C-0227 PROJ: DA-1-G-763702-DG-10 TASK: 1-G-763702-DG-1001 MONITOR: ECOM 0227-F Ralph N.

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Fuel cells, \*Detectors, Calcium hydrides, Hydrogen peroxide, Reliability(Electronics), Fabrication, Life tests, Auxiliary, Converters, Nickel cadmium

IDENTIFIERS: Calcium hydride fuel cells, Design

3 3

> The use of solid hydrides, solid super-oxides and hydrogen peroxide are examined as possible reactant sources for small fuel cell systems. Life testing of small calcium hydride-hydrogen peroxide powered alkaline matrix fuel cell is déscribed. A complete six volt fuel cell subsystem was constructed using calcium hydride as fuel and hydrogen peroxide as oxidant. Water vapor produced by the fuel cell is hydrogen peroxide. The six volt outbut from the fuel cell is fed into a DC-DC converter where its output is boosted to 32V. The 32V is floated across 23 - 50mA hour nickel-cadmium batteries. used to react with the hydride to produce further hydrogen fuel. A Kipp Generator supplies oxygen from the catalytic decomposition of the The total system can deliver a steady 2mA at 32V or 430 mA-60ms pulses at 26V.

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AD-A005 079

UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A005 065 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE VA

Wettability of the Casing and Electrolyte Leakage in Airtight Nickel-Cadmium Storage Batteries,

 $\widehat{\Xi}$ 

SEP 74 7P Boldin,R. V.; Sushentsova, S. N.; Milyutin,N. N.; REPT. NO. FSTC-HT-23-1002-74

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Vsesoyuznyi Nauchno-Issledovatelskii Akkumuliatornyi Institut. Sbornik Rabot po Khimicheskim Istochnikam Toka (USSR) v7 p161-163 1972.
DESCRIPTORS: \*Nickel cadmium batteries, \*Battery components, Containers, Steel, Wetting, Leakage(Fluid), Storage batteries,

The results of studying the wettability of 08KP steel used for manufacture of storage battery casings, with an alkali solution at various potentials of the metal's surface are presented. It is shown that greatest wettability, and consequently, an increased tendency toward electrolyte leakage along the storage battery casing is observed when the casing is connected electrically to the negative block of electrodes; smallest wettability is observed when the casing is insulated from the working electrodes.

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD-A005 060 10/3
ARMY FÜREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE

The Effect of Cobalt on the Characteristics of Lamellar Structure Nickel Oxide Electrodes Operating in a Zincate Electrolyte,

3

SEP 74 9P Kuzmin, Yu. A. : Mashevich, M. N. ; Uflyand, N. Yu. ; Frolova, S. P. ; REPT. NO. FSTC-HT-23-0999-74

# UNCLASSIFIED REPORT

SUPPLEMENTARY NDTE: Trans. of Vesoyuznyj Nauchno-Issledovatelskii Akkumuliatorayi Institut. Sbornik Rabot po Khimicheskim Istochnikam Toka (USSR) v7 p163-167 1972.

DESCRIPTORS: \*Electrodes, \*Storage batteries, Nickel Compounds, Oxides, Cobalt compounds,

DESCRIPTURS: \*Electrodes, \*Storage batteries,
Nickel compounds, Oxides, Cobalt compounds,
Reliability(Electronics), USSR,
Translations
IDENTIFIERS: \*Nickel oxides, \*Nickel zinc

3

3 3

A lamellar structure nickel oxide with an additive of cobalt has stable and high efficiency for nickel (68--75%) in a zincate electrolyte. Replacing the nickel oxide with a metal ceramic lamellar structure electrode with cobalt additive results in a structure electrode with cobalt additive results in a characteristics storage battery; in specific characteristics it is close to cadmium-nickel and iron-nickel, with average discharge voltage exceeding the voltage of the latter by 0.4 V, that is, by 32%.

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UNCLASSIFIED

86

AD-A005 060

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

CHRYSLER CORP NEW ORLEANS LA SPACE DIV

Development of an Aircraft Battery Conditioner/Analyzer.

3

DESCRIPTIVE NOTE: Final rept. 19 Jun 72-18 Dec 73, DEC 74 44P CONTRACT: DAAJO2-72-C-0108 PROJ: DA-1-F-162205-A-119 TASK: 1-F-162205-A-11901

# UNCLASSIFIED REPORT

TR-74-81

MONITOR: USAAMRDL

DESCRIPTORS: \*Nickel cadmium batteries, Test equipment, Analyzers IDENTIFIERS: Battery testers

33

The report documents the development and evaluation of a prototype Programmed Peak Charges (PPC) battery conditioner/analyzer system for nickel-cadmium batteries. It describes testing to determine the advantages of the unit as compared to constant-potential-charge systems. The results show that the PPC system reduces water boiloff, reduces overtemperature conditions, and has fewer battery recycles and cell replacements. Use of the PPC system increases battery life, reduces maintenance, and eliminates hazards.

### UNCLASSIFIED

DDC REPORT BIBLEDGRAPHY SEARCH CONTROL NO. ZOMOT

AD-A004 543 10/3 17/2 ESB INC YARDLEY PA ESB TECHNOLOGY CENTER Advanced High Capacity Battery for Aircrew Survival Iransceivers.

3

DESCRIPTIVE NOTE: Final rept., 10 Apr 72-28 Feb 74,
DEC 74 200P Doe,J. B. ;Dampier,F. W.
;Jeffries,K. ;Krouse,P. E. ;Margalit,N. ;
CONTRACT: F33615-72-C-1470
PROJ: AF-3145
TASK: 314522
MONITOR: AFAPL TR-74-63

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Primary batteries, \*Lithium.

\*Transmitter receivers, Cathodes, Lithium compounds, Arsenic Compounds, Fluorine compounds, Silver compounds, Dhosphates, Chromates, Molybdenum compounds, Oxides, Formic acid, Oxygen heteroCyclic compounds, Survival equipment IDENTIFIERS: Lithium organic cells, \*Lithium cells, Lithium hexafluoroarsenates, Silver chromates, Silver phosphates, Tetramethylene oxide, Formic acid/methyl ester, Propylene oxides, Butyrolactane, Molybdenum oxides, Arsenates/ (U)

A number of lithium-organic electrolyte electrochemical systems have been tested for feasibility in meeting requirements for aircrew survival communications equipment. These include: Li/LiAsF6 in tetrahydrofuran (THF)/ Ag3P04, Li/LiAsF6 in methylformate (MF)/Ag2Cr04, Li/LiAsF6 in gamma-butyrolactone (BL)/CFx, Li/LiAsF6 in 95% MF, 5% BL/CFx, Li/LiAsF6 in 95% MF, 5% PC/CFx (PC = propylene carbonate). Above systems were subjected to either a 165F or a 140F one week stand test and low temperature discharge tests at -20F and 40F. Discharge regime was 170 ma. for 30 minutes. Followed by 50 ma. for 30 minutes to 1.80 v. cutoff. Only systems capable of withstanding above stand conditions and meeting contract goal of 8 Whr/cu in at room temperature are: (1) Li/2.0 molar

UNCLASSIFIED

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DOC REPORT BIBLIDGRAPHY . SEARCH CONTROL NO. ZOMOT

MALLORY BATTERY CD TARRYTOWN N Y

Non-Hazardous Primary Lithium-Organic Electrolyte Battery BA-3390( )/U.

3

DESCRIPTIVE NOTE: Final rept. Jul 73-Sep 74, CONTRACT: DAABO7-73-C-0282
MONITOR: ECOM 0282-73-F

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Primary batteries, \*Lithium, \*Safety equipment, Vents, Sulfur oxides, Organic solvents, SUPPLEMENTARY NOTE: Electrolytes

3 IDENTIFIERS: \*Lithium cells, Organic batteries, Lithium bromide

3 The primary concern has been the fabrication of the subject batteries in conference with these guidelines and most important, the development of effective were system reliability, effectiveness, economics and safety mechanisms to insure non-hazardous operation under all conditions of storage, use and operation. Basic considerations for such safety mechanisms accordance with the performance/safety requirements adaptability to eventual automated production. The electrolyte consists of 70% sulfur dioxide by as defined in the Technical Guidelines for Non-The subject concerns the development and fabrication of Battery No. BA-5590( )/U in Electrolyte Batteries dated 29 March 1973. weight. The remaining 30% contains lithium Hazardous Primary Lithium-Organic bromide and the organic solvents.

### UNCLASSIFIED

SEARCH CONTROL NO. 20MG7 DDC REPORT BIBLIOGRAPHY

-A002 848 10/3 14/2 INVENTION TALENTS INC COLUMBUS OHIO

Analysis of Accelerated Life Test Data for Aerospace Nickel-Cadmium Cells.

3

DESCRIPTIVE NOTE: Final rept. Nov 72-Jul 74, Roeger, E. A. , Jr.; OCT 74 131P Roege McCallum, J.; Miller, G. H.; CONTRACT: F33615-73-C-2024 PROJ: AF-3145 TASK: 314522

TR-74-75 MONITOR: AFAPL

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: \*Nickel cadmium batteries, \*Accelerated testing, Reliability(Electronics), Predict ions

3

3 the cycle number in combination with prior knowledge about the probable cycles to failure for similar cells or batteries under the same end use conditions. When the slope of the voltage-log cycle line in the test can be made to coincide with similar slopes from prior knowledge, the battery under test will have the A process was developed for the accelerated life testing of a particular cell or battery which comprises the comparison and extrapolation of the end of discharge voltages plotted versus the logarithm of Same cycle life and failure mechanism as prior cells Or batteries. Acceleration of the test results is achieved because a duplication slope for the data indicates the probable presence of thousands of obtained during about the first hundred cycles Cycles anticipated by the prior knowledge.

PAGE

AD-A002 848

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO)

The Study of Magnesium/Silver Chloride Batteries Employing Various Electrolytes and Inhibitors,

3

Nagy, G. D. ; Powell, P. J. 21P OCT 74

REPT. NO. DREG-R-702

# UNCLASSIFIED REPORT

3 3 ESCRIPTORS: \*Magnesium batteries, \*Reserve batteries, \*Corrosion inhibition, Silver halides, Temperature, Canada
IDENTIFIERS: Magnesium silver chloride cells, Silver chlorides, Sodium chromates, AN/URT-503 Electrolytes, Lithium chloride, Chromates, DESCRIPTORS:

3 voltage, during and after discharge, on magnesium/
silver chloride batteries. These measurements were
made on single- and multiple-cell stacks at 45C.
A study of cell behavior was carried out to
determine the possibility of decreasing the corrosion
of the magnesium and extending the length of run-out
of the present system. An explanation is given for
the high corrosion rate of magnesium in 20%
LiCl solutions with 0.5% Na2Cr207. Measurements have been made of both temperature and Possible means of controlling this rate are also

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

)-A002 767 10/3 1/3 DEFENCE RESEARCH ESTABLISHMENT OTTAWA (DNTARID) AD-A002 767

Nickel/Cadmium Aircraft Batteries: Float Charge Test,

3

Feldman, Keiva ; LePage, REPT. NO. DREG-R-705 William A.

# UNCLASSIFIED REPORT

\*Nickel cadmium batteries, \*Storage batteries, \*Aircraft equipment, Reliability(Electronics), Test methods, Auxiliary, Canada DESCRIPTORS:

cadmium aircraft batteries which could pass the float Manufacturers have been unable to supply nickel/ charge test specified in the Canadian Forces

of defective cells and for limiting the overcharge on board the aircraft are made. Specification CF-B-70. Battery behavior under the conditions of the test has therefore been investigated. The batteries tested started into the float charge test are also made, so that it can be more useful in identifying those batteries which thermal runaway because oxygen generated at the nickel plate reached the cadmium plate and reacted exothermally with it. Recommendations are made for battery improvement, with respect to type of separator material and how it should be wrapped around the plates. Suggestions for modification of temperatures. Suggestions for improved screening are best able to withstand floating at high

AD-A002 789

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY EAGLE-PICHER INDUSTRIES INC COLORADO SPRINGS COLO PRECISION PRODUCTS DEPT

3 Vented Nickel-Cadmium Battery Assembly BB-651( )/U.

DESCRIPTIVE NOTE: Final rept. Jun 73-Nov 74, NOV 74 102P Hill, James M.; CONTRACT: DAAB07-73-C-0258 ECOM 0258-F MONITOR:

# UNCLASSIFIED REPORT

\*Nickel cadmium batteries, \*Battery Acrylonitrile polymers, Military requirements components, Reliability(Electronics), IDENTIFIERS: Design SUPPLEMENTARY NOTE: DESCRIPTORS:

design consisting of four monoblocks each containing five cells. A lightweight acrylonitrile butadiene styrene case was developed. The battery assembly is rated 24 volts and 5.5 ampere-hours or 12 volts and 11 ampere hours. This multiple voltage arrangement is possible as a result of the ECOM corner, edge and face. Thirty batteries were shipped to USAECOM upon successful completion of the testing. This final report outlines the design connector arrangement. The assembly was designed and tested. The environmental tests included The object of this contract was the design, development and testing of lightweight improved nickel-cadmium battery assembly BB-651( )/U. This battery assembly is a military-ruggedized and development program and fully documents the vibration, bounce and a four foot drop on each battery assembly design.

3

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

HELIOTEK SYLMAR CALIF AD-A002 142

Electrochemical Impregnation Methods to Produce Nickel Oxide Electrodes. Nickel -- Cadmium Battery Cells. Part II. High Energy Density Sintered Plate Type

3

DESCRIPTIVE NOTE: Technical rept. Dec 72-Dec 73, AUG 74 36P Pickett, D. F. ; Puglisi, V TR-74-56-Pt-2 J. ;Seiger, H. N.;Oliver, R. L.;
CONTRACT: F33615-73-C-2012

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, \*Electrodes, SUPPLEMENTARY NOTE:

33

Nickel Compounds, Fabrication, Impregnation, Reliability(Electronics), Spacecraft componen IDENTIFIERS: \*Nickel hydroxides

33

over conventional processes with remarkable electrode dependence on process time, formation procedure and degree of plate swelling as a function of loading level are discussed. Analytical procedures for both electrode and impregnation solution are given. The process offers considerable savings in time hydroxide electrodes for use in satellite battery cells is described. Reproducibility, loading level A pilot plant operation for producing nickel reproducibility.

PAGE

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

HONEYWELL INC HORSHAM PA POWER SOURCES CENTER AD-A002 075

3 Manufacture of Lithium Reserve Cells. DESCRIPTIVE NOTE: Final technical rept. Mar 73-Apr 74, JUL 74 142P Horning, Robert J. : Garoutte, 74 142P

CONTRACT: DAAA21-73-C-0677 Kurt F

UNCLASSIFIED REPORT

DESCRIPTORS: \*Reserve batteries, \*Lithium compounds, Welding, Glass, Stainless steel, Arsenic Anodes, Cathodes, Electrolytes, Seals, SUPPLEMENTARY NOTE:

DENTIFIERS: \*Lithium cells, Lithium hexafluoroarsenate, Lithium tetrafluoroborate, Borate/tetrafluoro, Arsenate/hexafluoro, compounds, Borates, Fluorine compounds, Fabrication, Reliability(Electronics)

3

3

difficulties were encountered and corrected during The manufacture of 1200 lithium reserve cells was accomplished within this contract. The cells manufactured conformed to Picatinny Arsenal P/ material was type 316L stainless steel and the electrolyte was of the formulation 2M LiAsF6 N 79275567 with the exception that the case (U.S.S) + 0.4M LIBF4/MF. TWO

stresses encountered during the final weld sealing of integrity of the glass-to-metal seal in the terminal plate or the cell. Investigation found the seal was developing fine leaks as a result of thermal cell. The seal problem was corrected and cell the course of this program. The first, a failure reconfigured to eliminate occurrence thereafter. The second more significant problem involved the of the anode electrode which was subsequently deliveries resumed.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

HONEYWELL INC HORSHAM PA POWER SOURCES CENTER

Lithium Reserve Battery.

3

DESCRIPTIVE NOTE: Final technical rept. Feb 72-Jun 74, Jul 74 369P Horning,Robert J.; Gallant, Horning, Robert J.; Gallant, JUL 74 369r W. Keith ;Ebner Walter B. ; ANTBACT: DAAA21-72-C-0437

CONTRACT:

UNCLASSIFIED REPORT

DESCRIPTORS: \*Reserve batteries, Battery components, SUPPLEMENTARY NOTE:

Electrolytes, Cathodes, Lithium compounds, Vanadium compounds, Corrosion,

Reliability(Electronics), Explosive actuators Arsenic compounds, Borates, Fluorine

IDENTIFIERS: \*Lithium cells, Design, Lithium compounds

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tetrafluoroborates, Borate/tetrafluoro, Lithium hexafluoroarsenates, Arsenate/hexafluoro, Vanadium

stability of a particular electrolyte formulation and was added to the contract to determine the causes for also to generate material specifications that will sufficiently describe and control the important The purpose of the contract was to design, develop and deliver a complete Lithium Organic Electrolyte Reserve Battery including characteristics of the electrolyte and constituent materials. The choice of electrolyte was based in activation mechanism to an initial specified configuration. An amendment to the scope of work part on the results obtained from comprehensive

Studies concerning the high temperature stability of determined that the LiBF4 was effective only when LiBF4 to these solutions greatly increased their 2M LiASF6/MF electrolyte solutions. It was found that the addition of small amounts of lithium metal was also present in the solution. high temperature storage capabilities. It was LiBF4 was able to stabilize solutions prepared with grades of LiAsF6 obtained from other vendors but to a much lesser degree.

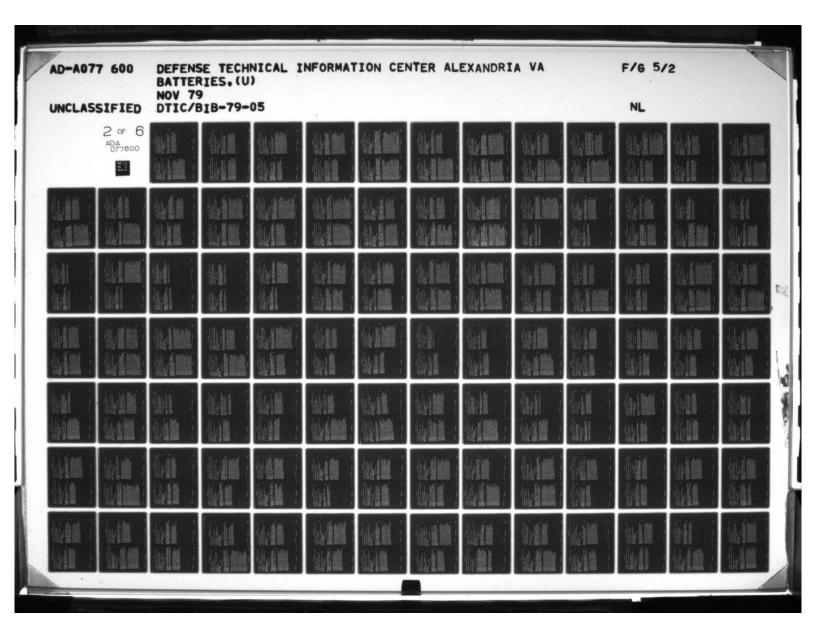
AD-A001 674

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DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A001 529 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J Engineering Evaluation of the Zinc-Mercuric Oxide Battery/Nickel-Cadmium Battery Hybrid System.

3

DESCRIPTIVE NOTE: Research and development technical rept.,
NOV 74 18P Wood, Donald B.;
REPT. NO. ECOM-4276

UNCLASSIFIED REPORT

PROJ: DA-1-5-76205-AH-94

DESCRIPTORS: \*Primary batteries, \*Storage batteries, Reliability(Electronics), Transmitter receivers, Nickel cadmium batteries, Mercury batteries, Temperature, Circuits
IDENTIFIERS: Mercury zinc cells (U)

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Appreciable improvements in the operating characteristics of the zinc mercuric oxide (Zn/HgO) primary battery were obtained at +20°C on communication (transmit/receive) type loads by using it in parallel with a nickel cadmium (NiCd) secondary battery. However, at 70°C, the Zn/HgO battery-NiCd battery hybrid system failed to provide as much capacity as the Zn/HgO battery alone because of overcharge during the receive portion of the discharge. Data are presented to show the influence on capacity of duty cycle (1 minute/9 minutes versus 1 minute/4 minutes), charge current controls during the discharge (50 ohms versus 90 ohms), and discharge loads (70 ohms/1400 ohms and 140 ohms/2800 ohms). Overcharge during pre-charge of the Nicd battery by the Zn/HgO battery prior to test can have a significant effect on the final capacity obtained.

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### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL ND. ZOMOT

AD-A001 526 10/3 1/3
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

Data Acquisition Test Report on OH-58A Nicad Battery Operation.

3

DESCRIPTIVE NOTE: Final technical rept., OCT 74 78P Maguire, James T. REPT. NO. ECOM-4267 PROJ: DA-1F-264201-DC-97 TASK: 1-F-264201-DC-97-14

UNCLASSIFIED REPORT

DESCRIPTORS: \*Helicopters, \*Aircraft equipment, \*Nickel cadmium batteries, Data aquisition, Flight testing, Installation, Data reduction IDENTIFIERS: H-58 aircraft, OH-58A aircraft

33

This report describes the data collection effort on an OH-58A to provide information to allow implementation of a laboratory simulation of battery loading under controlled conditions. A tabulation and graphical display of the recorded results are contained in Appendix 3. Procedures for the installation and testing have been detailed in Appendics 1 and 2.

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PAGE

Self-Discharge of Silver-Zinc Batteries Filled with Electrolyte,

3

Klyazin, B.; Zakharova, Y.; REPT. NO. FSTC-HT-23-630-74

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Unedited trans. of Vsesoyuznyi Nauchno-Issledovatelskii Akhumuliatornyi Institut. (USSR) v6 p128-134 1971. DESCRIPTORS: \*Silver zinc batteries, Electrolytes, Storage, Degradation, Sbornik Rabot po Knimicheskim Istochnikam Toka Reliability(Electronics), Translations,

particular focus made on the negative zinc electrode of the battery and the chemical and physical changes discharge to such an extent that the performance and Ultimately, the experiment lays the foundation for The article is a survey of an experiment in which batteries filled with electrolyte were allowed to stand under various conditions of time and temperature, with the goal of understanding the process of self-discharge of batteries. There is understanding the total process of battery selfit undergoes throughout the experiment. life of batteries can be improved.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

0-4001 219 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE AD-A001 219

3 Automatic Device for Controlling the Charging of Storage Batteries with Electrolyte,

Ivchenko, V. N.; REPT. NO. FSTC-HT-23-143-74 Pogrebinskii, V. G. **6**P

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Unedited trans. of Patent (USSR) 329 604.

DESCRIPTORS: \*Electric batteries, \*Filling, \*Automation, Control systems, Automatic, Control, Electrolytes, Density, Liquid level control, Monitoring, Patents, Translations,

 $\widehat{\Xi}$ 

3

3 closes the circuit through the sensor the electrolyte An automatic device for control of charging of a storage battery with electrolyte and monitoring the electrolyte density is discussed and a circuit electrolyte level sensor, electromagnetic valve, flip-flop control system and signal lamps. The circuit is arranged so that when the electrolyte electrolyte density is not up to standard, the current is shunted through a slightly different supply valve is closed, and so that, if the diagram is provided. The device contains an signal system.

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AD-A001 498

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A000 845 10/3
EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT High-Power Lithium-Organic Electrolyte-CF

DESCRIPTIVE NOTE: Final rept. 31 May 73-4 Jul 74, Jul 74 133; Higgins, Robert L.; CONTRACT: DAABO7-73-C-0219 MONITOR: ECOM 73-0219-F

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:
DESCRIPTORS: \*Primary batteries, \*Nonaqueous electrolytes, Organic solvents,
Cathodes(Electrolytic cell),
Performance(Engineering), Lithium, Graphited materials, Fluorides, Battery separators,
Electrical conductivity, Fabrication
IDENTIFIERS: \*Lithium graphite fluoride cells,

3

The Final Report covers work performed on the lithium battery program, 'High Power Lithium-Organic Electrolyte-CF Cell' from 31 May 1973 to 4 July 1974. Development of cathode, anode, separator, and electrolyte is discussed, and final cell design and performance are reported. (Modified author abstract)

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD-A000 417 10/3
AIR FORCE AERD PROPULSION LAB WRIGHT-PATTERSON AFB OHIO

Analysis of a Cooling Concept for High-Discharge-Rate Pile Type Batteries.

3

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DESCRIPTIVE NOTE: Technical rept. Mar-Sep 73,

JUL 74 40P REPT. NO. AFAPL-TR-10 PROJ: AF-3145 TASK: 314522

# UNCLASSIFIED REPORT

DESCRIPTORS: \*Electric batteries, High energy, Density, Heat sinks, Internal, Cooling, Feasibility studies, Thermal analysis

3

The report presents a feasibility analysis of an internal cooling technique for pile-type batteries. A first-order thermal analysis is done for a battery design which uses internal heat sinks placed directly between the battery cell stacks. The heat sink contains a phase-change material and is specifically designed to permit a continuous pile. A more accurate solution (higher order) may be attempted if experiment indicates the current results are inadequate. The problems of fabricating such cooling devices are not addressed here but an analysis of their performance is. The equations derived are not difficult to use in designing the cooling devices. This cooling technique is attractive for high current density pile-type batteries, anot wanted. (Author)

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UNCLASSIFIED

AD-A000 417

SEARCH CONTROL NO. ZOMOT DOC REPORT BIBLIDGRAPHY

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE AD-A000 246

3 Processes During Storage of Charged Silver-Cadmium (Ag-Cd) Batteries,

Mclotkova, E. N. ; Lipunova REPT. NO. FSTC-HT-23-631-74 14P

# UNCLASSIFIED REPORT

33 DESCRIPTORS: \*Storage batteries, \*Battery chargers, SUPPLEMENTARY NOTE: Trans. of Vsesoyuznyi Nauchno-Issledovatelskii Akkmulisternyi Institut. Sbornik Rabot po Khimicheskim Istochnikam Toka (USSR) n6 Silver, Cadmium, Reliability(Electronics), Translations, USSR IDENTIFIERS: Charging, Silver cadmium cells 108-117 1971.

3 cellulose separative film during the process of long force of the capacity of the discharge voltage, the phase composition of goid electrode plugs, the temperatures of 20-50 degrees. The question of the composition of an electrolyte, and of the hydratepossible mechanism for self-changing processes is The paper presents data showing the change of the electrical characteristics of the electromotive storage of charged silver-cadmium batteries at

### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

PENNSYLVANIA UNIV PHILADELPHIA DEPT OF CHEMICAL AND BIOCHEMICAL ENGINEERING 10/3 AD- 914 248

Electrochemical Engineering of Battery Systems.

3

DESCRIPTIVE NOTE: Final rept. 10 Nov 71-9 Nov 72, Nanis, Leonard ; CONTRACT: N00019-72-C-0166

# UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*ANODES(ELECTROLYTIC CELL), \*REFLECTION), (\*ALKALINE BATTERIES, MONITORS), CADMIUM, CADMIUM COMPOUNDS, HYDROXIDES, POROUS MATERIALS, ELECTRIC DISCHARGES, MODELS(SIMULATIONS), MATHEMATICAL MODELS, LIGHT, SCATTERING, ELECTROCHEMISTRY, POLARIZATION, OPTICAL PROPERTIES, BATTERY COMPONENTS, ELECTRIC BATTERIES IDENTIFIERS: NICKEL CADMIUM BATTERIES

3 disturbing the battery operation. Thus, cycling effects on the current redistribution can be analyzed behavior. Change in the diffusely reflected light from the current collector side of a cadmium negative absorption and thus the change in diffuse reflectance. The monitoring by optical changes corresponding to the material changes of the current collector region of the anode permits determination of the essential features of the profile without Changes in diffusely reflected light scattered from a battery electrode (Cd negative) have been shown to be well correlated with the electrochemical anode for discharge) precedes the onset of rapid passivation type of polarization determined at the front (solution) side of the porous electroder. The chemical change of Cd to Cd(OH)2 during discharge is considered to cause the variation of optical parameters for light scattering and and effective battery performance evaluated. (Author)

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

GOULD INC MENDOTA HEIGHTS MINN GOULD LABS AD- 913 104

Miniature Sealed Nickel-Cadmium Batteries

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Menard, Claude J. : Walsh, DESCRIPTIVE NOTE: Final rept. Mar 71-Jun 72 CONTRACT: DAMBO7-71-C-0127 PROJ: PRON-C8-1-04425-01-C8-CA MONITOR: ECOM 0127-F . ; Kohl, Kenneth C. ; John R

# UNCLASSIFIED REPORT

EQUIPMENT), (\*ALKALINE BATTERIES, MINIATURE ELECTRICAL EQUIPMENT), (\*ALKALINE BATTERIES, MINIATURE ELECTRICAL EQUIPMENT), NICKEL, CADMIUM, BATTERY COMPONENTS, ELECTRIC BATTERIES, ELECTRODES, BATTERY SEPARATORS, CAPACITANCE, ELECTRIC DISCHARGES, STORAGE, LIFE EXPECTANCY, ENVIRONMENTAL TESTS, ELECTROLYTES, POTASSIUM COMPOUNDS, HYDROXIDES DESCRIPTORS:

delivery of 100 cells and 20 12-volt batteries of each type. Within the cell dimension and weight limits imposed, the selection of the prototype batteries included investigations on two basic design assemblies; i.e., a 2-plate design and a 4-plate design. The prototype design for the 50 mAh of the 4-plate construction; i.e., two positives The purpose of this program has been to design, develop, fabrica.e, and test miniature high-rate sealed nickel-cadmium batteries of the button cell construction. The battery types are BB-683()/U (50mAh), BB-684()/U (100mAh), and BB-686()/U electrical, and other environmental tests). The weights of the three-4-plate batteries (100, 150, and 250 mAh sizes) were 8.3, 10.3, and 14.3 g two negatives. The four prototype designs met battery is the 2-plate construction; i.e., one positive and one negative. The other three types prototype models, qualification tests on the prototype batteries in accordance with the the requirements (dimensions, weights, specification SCL-6899A, fabrication, and follows: design parameter study to select (250mAh). The program was carried out as

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY AD- 912 458

- 912 458 10/3 11/6 CALIFORNIA UNIV LOS ANGELES SCHOOL OF ENGINEERING AND APPLIED SCIENCE 3

Fennion, Douglas N. ; Gu, Failure Analysis of Porous Electrodes DESCRIPTIVE NOTE: Final rept., UCLA-ENG-7347 N00019-72-C-0256 Hiram : Hubbar, Ranna K. ; MAY 73 28P

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*ELECTRODES, \*STORAGE BATTERIES), (\*POROUS METALS, ELECTRODES), FAILURE(MECHANICS), SILVER COMPOUNDS, SILVER ALLOYS, CHEMICAL PROPERTIES, CHEMICAL REACTIONS, X RAYS, SCANNING, ELECTRIC CURRENTS, DENSITY, SURFACES, ELECTRON MICROSCOPY, PARTICLE SIZE, ELECTRIC DISCHARGES, REACTION KINETICS, ELECTROLYTES, GONCENTRATION(CHEMISTRY), SILVER, PLATING, DIFFUSION, GRAPHITE, ELECTROLYTIC CELLS, LITHIUM COMPOUNDS, LITHIUM FLUORIDES, CARBON

The formation of AgCI was also observed to form mainly from electrolyte diffusion paths as opposed to discharge plateaus were observed, one occurring above 4.0 V and another more predominant one between 2.8 nonaqueous secondary batteries has been investigated. Experiments were carried out on a cell of the type characteristic of the discharge plateau of a primary Constructed for the study of elementary processes that occur in porous electrodes. X-ray element scan was applied to determine the average local transfer current densities inside the pore. The morphology intercalation compounds of graphite as reactants in solid phase diffusion. A porous structure of silver was observed after cycling. The use of of AgC on the surface of silver was studied using a scanning electron microscope. It was found that the size of AgCI particles depended on the average local current densities and the local densities gave smaller AgC1 mounds, in general. battery using fluorographite as the reactant. electrolyte concentrations. Higher current and 2.5 V. The lower discharge plateau is A single pore Ag/AgC1 electrode was Li/Lic104, DMSU/C, LiF. Two

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

GOULD INC MENDOTA HEIGHTS MINN GOULD LABS AD- 911 508

Rapid Charger for Maintenance-Free Batteries.

3

DESCRIPTIVE NOTE: Semi-annual rept. 1 May-31 Dec 71, Hermann, John A. ; MAR 73 72F Her CONTRACT: DAAB07-71-C-0209 PROJ: DA-1-T-062119-A-053 TASK: 1-T-062119-A-05305 MONITOR: ECOM 0209-1-71

# UNCLASSIFIED REPORT

3 DESCRIPTORS: ("STORAGE BATTERIES, "BATTERY CHARGERS), (\*ALKALINE BATTERIES, BATTERY CHARGERS), NICKEL, CADMIUM, SILVER, ZINC, BATTERY COMPONENTS, ELECTRIC BATTERIES, OPERATION, DESIGN, AUTOMATION, INTEGRATED CIRCUITS, LOGIC CIRCUITS, PRINTED CIRCUITS, SYSTEMS ENGINEERING, MAINTENANCE, MECHANICAL DRAWINGS IDENTIFIERS: NICKEL CADMIUM BATTERIES, SILVER ZINC BATTERIES

charging approaches for rapid charging sealed nickelcadmium, vented nickel-cadmium, and silver zinc-oxide batteries. A programmable charger was to be modes with each having necessary controls for varying charge current, discharge current, charge frequency, and mode selection. As of the time period covered designed, manufactured and used as a tool during the charger was initiated at the beginning of the contract. Throughout the first nine months of the program, the charger was designed, breadboard portions were evaluated, and final hardware built. Upon the completion of initial hardware, the system was checked out and problem areas corrected. The charger was designed to have five basic operating by this report, no testing of charge approaches has The purpose of this program was to evaluate various stated are that a working programmable charger was designed, fabricated, and tested. (Author) evaluation of the various charging approaches. To accomplish the objectives, a paper design and breadboard of the circuitry for the programmable started; therefore, the only results which can be

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT AD- 911 384

Water Activated Zinc-Silver Oxide Primary Battery.

3

DESCRIPTIVE NOTE: Final rept. 16 Feb 71-15 Mar 73, JUN 73 55P Brown, Curtis C.; JUN 73 55P Bro DA-1-T-062705-A-053 1-T-062705-A-05302 MONITOR: ECOM 0129-F-71

# UNCLASSIFIED REPORT

BATTERIES), ZINC, SILVER COMPOUNDS, OXIDES, MANUFACTURING, PERFORMANCE(ENGINEERING), ARMY EQUIPMENT TEST EQUIPMENT ( \* WATER ACTIVATED BATTERIES, \*PRIMARY IDENTIFIERS: ZINC-SILVER OXIDE BATTERY DESCRIPTORS:

results. The evaluation test showed compliance with Silver Oxide reserve battery in accordance with 'Technical Guidelines for Water Activated Zinc-Silver Oxide Battery'. This includes a description of the design effort, the design, the test program, the test equipment and the test This report describes the design development, manufacture and evaluation testing of a Zinc3

the requirements of the technical guidelines.

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

LOCKHEED MISSILES AND SPACE CD INC PALO ALTO CALIF PALC ALTO RESEARCH LAB 19/1 10/3 AD- 909 147

3 Multifunctional Explosive Battery.

DESCRIPTIVE NOTE: Final rept. 3 Jun 71-3 Dec 72.
JAN 73 59P Bauman, Hubert F.;
CONTRACT: F08635-71-C-0179

AF-670A

TR-73-4 WONITOR: AFATL

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, \*EXPLOSIVES), POWER SUPPLIES, ELECTRIC CURRENTS, STORAGE, ENERGY, DENSITY, TEMPERATURE, DORD TESTS, DETONATIONS, ELECTROLYTES, GELS, LITHIUM COMPOUNDS, OXIDES, HYDROCARBONS, METHANE, CARBONATES, ALUMINUM COMPOUNDS, EXPLOSIONS, SENSITIVITY, ANDDES(ELECTROLYTIC CELL), CATHODES(ELECTROLYTIC CELL), CATHO IDENTIFIERS: ALUMINUM COMPOUNDS, CHLORIDES, CARBONATES, ETHYLENE, \*EXPLOSIVE BATTERIES, LITHIUM PERCHLORATE, LITHIUM VANADIUM PENTOXIDE, NITROMETHANE, VANADIUM(V) COMPOUNDS

3 reserve cells by storing the solvent system in a reservoir and having the electrolyte salts present in whose feasibility was established during an earlier electrolyte gelling, but this could be prevented in without significant damage. Detonation was demonstrated over a temperature range of -60 to 160 temperatures from -40 to 160 F. Energy densities of over 40 Whr/1b were obtained with discharges at -10 and 70 F. Batteries survived drop tests evaluation. High temperature storage results in This report covers work on an explosive battery ethylene carbonate lithium perchlorate-aluminum F, but the test fixture did not allow complete program. On the present program, the lithium vanadium pentoxide couple with a nitromethanechloride electrolyte was selected for battery fabrication and evaluation. Batteries were discharged at rates from 4 to 400 mA and at the separator.

### UNCLASSIFIED

SEARCH CONTROL NO. 20MO7 DOC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N 10/3 AD- 908 198

Performance Characteristics of Magnesium-Manganese Dioxide/Nickel-Cadmium Hybrid System.

3

DESCRIPTIVE NOTE: Technical rept., JAN 73 20P W REPT. NO. ECOM-4071 PROJ: DA-1-T-062119-A-053 1-T-062119-A-05302

### UNCLASSIFIED REPORT

3 3 PERFORMANCE(ENGINEERING)), (\*PRIMARY BATTERIES,
PERFORMANCE(ENGINEERING)), (\*STORAGE BATTERIES,
PERFORMANCE(ENGINEERING)), ALKALINE BATTERIES,
MAGNESIUM, MAGNESIUM OXIDES, NICKEL, CADMIUM, MILITARY
REQUIREMENTS, RADIO EQUIPMENT, PORTABLE EQUIPMENT,
TRANSMITTER RECEIVERS, (U)TRANSMITTER RECEIVERS
IDENTIFIERS: AN/PRC-77, \*HYBRID BATTERIES, NICKEL-DESCRIPTORS: (\*BATTERY COMPONENTS, CADMIUM BATTERIES

3 the higher percentage occurring at the higher current drains. At 20F, 5 hours of operation are obtained with the hybrid system where none is available from the 3-volt section was not considered in this experiment. The anticipated power requirements of future field radio sets, which demand up to three times the power of Radio Set AN/PRC-77, the present major military field radio, were used in the Improvements in the operating characteristics of the 14.4 volt section of Magnesium Battery BA-4386/PRC-25 are obtained by utilizing the battery in parallel directly with nine sealed 250 mAh Battery BA-4386/PRC-25 contains a 3-volt section as well as the 14.4-volt section; however, study. Delayed action was not observed on any of the evaluations except on the first cycle at 20F. Improvements in capacity at 70F ranged from 40% (secondary) battery adds 15% to the total weight of the hybrid system and 11% to the total to 98%, based on the BA-4386/PRC-25 alone, with the BA-4386/PRC-25 alone. The nickel-cadmium

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AD- 908 198

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ZOMOZ DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

CALIFORNIA UNIV BERKELEY SEA WATER CONVERSION LAB AD- 882 890

Organic Electrolyte Permselective Membranes.

3

DESCRIPTIVE NOTE: Rept. no. 4 (Final), 1 Apr 68-15 Dampier, F. W. ; Spiegler, K. 78P MAR 71 Sep 70,

CONTRACT: DAAB07-67-C-0590 PROJ: DA-1-T-061102-A-34-A TASK: 1-T-061102-A-34-A-00 MONITOR: ECOM 0590-F

### UNCLASSIFIED REPORT

3 3 SUPPLEMENTARY NOTE: See also AD-859 386.
DESCRIPTORS: (\*STORAGE BATTERIES, BATTERY SEPARATORS), (\*MEMBRANES, TRANSPORT PROPERTIES), (\*BATTERY SEPARATORS, PERMEABILITY), LITHIUM, COPPER COMPOUNDS, HALIDES, ELECTRICAL RESISTANCE, GLASS, ELECTRIC DISCHARGES, SOLUTIONS (MIXTURES), ELECTROLYTES, ION IDENTIFIERS: COPPER CHLORIDE LITHIUM CELLS, COPPER FLUORIDE LITHIUM CELLS, HIGH ENERGY CELLS, \*LITHIUM CELLS, \*ORGANIC BATTERIES, PROPYLENE CARBONATE EXCHANGE RESINS

3 dissolved in propylene carbonate (PC).
Specifically, these membranes should prevent self-discharge of lithium-copper halide cells. Since literature data suggest that self-discharge is caused by transport of anionic copper complexes to the primarily cation-exchange membranes, which are known various commercial and specially-prepared membranes electrolyte diffusion, interdiffusion and transport permeability for anions was tested by a variety of number measurements. It was established that most to exclude anions in aqueous solutions. Selective Experiments were performed to assess the value of lithium electrode, the separators selected were commercial cation-exchange membranes have high resistances in PC, but three membranes with resistances less than 250 ohms sq cm in 0.50 M LiC104/PC at 25 C were found, viz. C-322 (American Machine and Foundry Co., Conn. - 117 ohm sq cm), UM-05 (Amicon Corp., Lexington, Mass. Stamford.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

TEXAS INSTRUMENTS INC ATTLEBORD MASS METALLURGICAL MATERIALS DIV TECHNICAL CENTER 10/3 AD- 873 119

Development of Lower Cost Nickel-Zinc Batteries.

3

DESCRIPTIVE NOTE: Rept. no. 1 (Final), Feb 69-May

Popat, P. V. ; CONTRACT: DAAB07-69-C-0172 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302 0172-F MONITOR: ECOM JOE

# UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), (\*ALKALINE BATTERIES, DESIGN), ELECTRODES, ZINC, NICKEL, RELIABILITY(ELECTRONICS), COSTS, LIFE EXPECTANCY IDENTIFIERS: BB-509()/U BATTERIES, NICKEL CELLS, \*NICKEL ZINC CELLS, ZINC CELLS

3 Nickel-Zinc Electrochemical system. The optimum design data was established for the positive The objective of the work was to develop a low cost secondary battery, BB509( )/U in the\_\_\_\_\_ and negative electrodes as well as cell design parameters. Theoretical capacity for the positive electrode was 9.5 AH/cu in. The zinc electrodes are oversized, contoured and Teflocated. A cycle life of over 250 62 1/2% D.D. cycles has been obtained on prototype cells. (Author)

AD- 873 119

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS

 $\widehat{\Xi}$ Failure Mechanisms and Accelerated Life Tests of Nickel-Cadmium Batteries.

DESCRIPTIVE NOTE: Annual technical rept. no. 1, 1 May 69-30 Apr 70, McCallum, John ; Miller, 78P 20

Gerald H. ; AF-3145

MONITOR: AFAPL TR-70-44

# UNCLASSIFIED REPORT

33 RELIABILITY(ELECTRONICS)), (\*ALKÁLINE BATTERIES,
PERFORMANCE(ENGINEERING)), ACCELERATED TESTING, NICKEL,
CADMIUM, THERMAL CONDUCTIVITY, THERMAL STABILITY (U)
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES (U) ( \* PRIMARY BATTERIES DESCRIPTORS:

strains and strain rates) as an approach to valid accelerated life testing of nickel-cadmium batteries. The stresses identified for the aging of sealed batteries are (1) temperature gradients, (2) voltage gradients, (3) concentration gradients, and (4) pressure gradients. Plans to develop nickel-cadmium cells with longer life because of The report describes the experiments planned to verify the 'gradient hypothesis' (all aging is caused by intensity gradients with their associated

device such as a battery. Aging will then be associated with the time rate, or cycle rate, of change of the proportionality constants in the spring and dashpot combination. Data from continuing and dashpots is being developed as an analogy of how decreased intensity gradients are also described in stresses, strains, and strain rates can be combined simulated orbital life tests are reported for later the report. A mathematical model based on springs to describe the performance of any energy storing analysis and discussion. Also, cell component

PAGE

3

cells are compared with measured values for cells and

with values predicted for the cells

thermal conductivity measurements are reported and conductivities and resistivities of nickel-cadmium

discussed. Then, literature values for thermal

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS AD- 870 688

Lithium Battery Research

3

DESCRIPTIVE NOTE: Annual rept. no. 2, 1 Apr 69-31 Mar

Semones, D. E. ; Tidwell, T. H. ; McCallum, J. ; SSS

REPT. NO. BAT-8917-2 CONTRACT: F33615-68-C-1282 PROJ: AF-3145

TR-70-38 AFAPL MONITOR:

# UNCLASSIFIED REPORT

color other than black and white are available until stock SUPPLEMENTARY NOTE: Limited number of copies containing is exhausted. Reproductions will be made in black and

3 white only.
DESCRIPTORS: (\*STORAGE BATTERIES, \*LITHIUM), ELECTRODES, ELECTROLYTES, ORGANIC SOLVENTS, FLUGRIDES, CHLORIDES, COPPER COMPOUNDS, SILVER COMPOUNDS, CADMIUM COMPOUNDS, CARBONATES, LACTONES, SULFOXIDES, HYDROXIDES, CYANIDES, (

3 IDENTIFIERS: CADMIUM CHLORIDE LITHIUM CELLS, COPPER FLUORIDE LITHIUM CELLS, \*LITHIUM CELLS, LITHIUM SILVER FLUORIDE CELLS, PROPYLENE CARBONATE

change-dischange characteristics of the cathodes and of lithium anodes, separator properties, voltammetry of electrolytes, mass transport effects, and compatibility of cell components with electrolytes. The heport describes research with three metal halides, AgF, CuF2, and CdCl2, for possible incorporation into secondary batteries. Stable, conductive organic solvents were also sought for use in combination with electrolytes having the same anion as the metal halide. The experimental program included the study of the

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AD- 870 688

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 869 983 10/3 HONEYWELL INC MONTGOMERYVILLE PA LIVINGSTON ELECTRONIC LAB 20 Watt Liquid Ammonia Battery. (U)

DESCRIPTIVE NOTE: Final technical rept. 2 Oct 68-2 Oct 69,

MAY 70 71P Horning, Robert J.; CONTRACT: F30602-69-C-0064 PROJ: AF-5592 TASK: 559203

MONITOR: RADC TR-70-19

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, \*AMMONIA), (\*RADIO EQUIPMENT, PRIMARY BATTERIES), PORTABLE EQUIPMENT, DESIGN, RELIABILITY(ELECTRONICS)
IDENTIFIERS: \*AMMONIA ACTIVATED BATTERIES, RESERVE BATTERIES

The application of existing technology in the field of non-aqueous electrochemistry was applied to specific requirements for a liquid ammonia primary reserve battery that could be used with manpack communications equipment. The design requirements were tailored to meet the AN/RRC-66 Radio Set requirements. In order to achieve this the individual cell characteristics were optimized, packaged in a suitable container to mate with the AN/RRC-66, and integrated with a disposable activation system capable of five year storage life. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 869 155 10/3 NEW YORK UNIV BRONX DEPT OF CHEMICAL ENGINEERING

Electrode-Electrolyte Interactions Magnesium Anodes : meta-Dinitrobenzene Cathodes.

3

DESCRIPTIVE NOTE: Semi-annual rept. no. 3, 1 Jan-30 Jun 69,

APR 70 23P Adubifa, Akim ; Smaldone, Gerald ; Stern, Gideon ; Wikstrom, Leonard Lee ;

CONTRACT: DAABO7-68-C-0143 PROJ: DA-1-T-061102-A-34-A TASK: 1-T-061102-A-34-A-02 MONITOR: ECOM 0143-3

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Semi-annual rept. no. 2,
AD-865 587.
DESCRIPTORS: (\*NITROBENZENES, \*CATHODES(ELECTROLYTIC
CELL)), (\*PERCHLORATES, ELECTROLYTES), (\*MAGNESIUM
ALLOYS, \*ANODES(ELECTROLYTIC CELL)), DXIDATION REDUCTION
REACTIONS, ELECTROCHEMISTRY, CORROSION
IDENTIFIERS: \*BENZENE/DINITRO, \*MAGNESIUM
DINITROBENZENE CELLS, MAGNESIUM PERCHLORATE, \*ORGANIC
BATTERIES

3 density of the magnesium electrode is much smaller in electrolyte mix the corrosion current density of the 21) and hydrogen evolution reaction on magnesium in Mg(ClO4)2, Sr(ClO4)2, NaClO4, and NaClO4-Mg(ClO4)2 electrolyte mix magnesium electrode increases as the proportion of Mg(C104)2 is increased. In the mixed electrolyte system the magnesium electrode can exhibit two distinctly different corrosion current The electrochemical dissolution of magnesium (AZdensities. These corrosion current densities are Polarization data indicate the corrosion current dependent upon the history of the electrode. The rate of meta-dinitrobenzene reduction in NaC104 reduction of meta-diritrobenzene in NaCiO4 and have been investigated. The electrochemical and Mg(C104)2 was found to be about equal. the NaClO4 than in the other electrolytes studied. In the NaClO4 - Mg(ClO4)2Mg(C104)2 has also been studied.

101

AD- 869 983

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 866 228

Progress Report on the Magnesium Flat

3

Wood, Donald B. ; Technical rept., DESCRIPTIVE NOTE:

DA-1-T-662705-A-053 JAN 70 22P PROJ:

1-T-662705-A-05302 TASK:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*DRY BATTERIES, DESIGN), PRIMARY BATTERIES, MAGNESIUM, MANGANESE COMPOUNDS, DIOXIDES IDENTIFIERS: \*MAGNESIUM CELLS, MANGANESE(IV) OXIDE

3 and performance and storage data are tabulated, as is a comparison with the tmagnesium round cell battery. Advantages and technical difficulties are discussed. The buitery has been wrapped in plastic for moisture retention. (Author, modified-PL) The development of the mangesium flat cell battery since 1958 is presented. Various flat cell designs are shown. Current development status is discussed

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

YARDNEY ELECTRIC CORP NEW YORK

Silver-Zinc Missile Power Supply.

3

DESCRIPTIVE NOTE: Technical rept. no. 11 (Final) Jul Chireau, Roland F. ; 65-Dec 69, DEC 69 244P Ct CONTRACT: AF 33(615)-2663

PROJ: AF-3145 TASK: 314522

#### UNCLASSIFIED REPORT TR-69-4 MONITOR: AFAPL

DESCRIPTORS: (\*GUIDED MISSILE BATTERIES, \*ALKALINE
BATTERIES), (\*POWER SUPPLIES, \*GUIDED MISSILES), PRIMARY
BATTERIES, DC TO DC CONVERTERS, SILVER, ZINC,
ELECTROCHEMISTRY, STORAGE BATTERIES
IDENTIFIERS: \*SILVER ZINC BATTERY CELLS

33

The report presents, in chronological order, the design, development, fabrication and evaluation efforts conducted on the Silver-Zinc Missile (duplex electrode) Ag/Zn primary battery in combination with a nominal 8.5 KW output solid state DC-DC converter with a 3 KV output (at Supply package consists of a 95 VOH pile type 1.25 amp), a 1.5 KV output (at 2.03 amp), a 15 Amp constant current output, and five low Power Supply program. Each Missile Power voltage outputs. (Author)

3

AD- 865 806

SEARCH CONTROL NO. ZOMO7 NEW YORK UNIV BRONX DEPT OF CHEMICAL ENGINEERING DOC REPORT BIBLIOGRAPHY AD- 865 587

3 Electrode-Electrolyte Interactions Magnesium Anodes: meta-Dinitrobenzene Cathodes.

DESCRIPTIVE NOTE: Semi-annual rept. no. 2, 1 Jul-30 Adubifa, Akim ; Smaldone, Gerald ; Stern, Gideon ; Wikstrom, Leonard Lee; CONTRACT: DAAB07-68-C-0143 PROJ: DA-1-T-061102-A-34-A 31P Dec 68, DEC

### UNCLASSIFIED REPORT

TASK: 1-T-061102-A-34-A-00

0143-2

ECOM

MONITOR:

CELL)), (\*MAGNESIUM ALLOYS, \*ANODES(ELECTROLYTIC CELL)), (\*MAGNESIUM ALLOYS, \*ANODES(ELECTROLYTIC CELL)), (\*NITROBENZENES, CATHODES(ELECTROLYTIC CELL)), ELECTROLYTES, MAGNESIUM COMPOUNDS, PERCHLORATES, 3 3 SUPPLEMENTARY NOTE: See also Semi-annual rept. no. 1, IDENTIFIERS: BENZENE/DINITRO, MAGNESIUM PERCHLORATE, \*MAGNESIUM DINITROBENZENE CELLS, \*ORGANIC CORROSION, RELIABILITY (ELECTRONICS), ELECTROCHE" ISTRY DESCRIPTORS: BATTERIES

3 magnesium perchlorate, sodium perchlorate and a mixed electrolyte of sodium and magnesium perchlorate has been investigated. In the sodium perchlorate electrolyte, 0.4M to 4.0M, the Tafel Slope of the h.e.r. was unaffected by the direction of the magnitude faster than that in the sodium perchlorate electrolytes. The rate of magnesium dissolution in the h.e.r. changes with direction of the potential The electrochemical dissolution of magnesium (AZcurrent density of magnesium in the magnesium perchlorate was three orders of magnitude greater the magnesium perchlorate was about an order of potential sweep. In the magnesium perchlorate electrolytes was 50 mv and 30 mv in the mixed electrolyte, 0.2M to 2.0M, the Tafel Slope of electrolyte. On the other hand the corrosion than in the sodium perchlorate electrolyte. 21) and the h.e.r. on magnesium (AZ-21) in sweep. The anodic Tafe' Slopes in the pure

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

CALVIN COLL GRAND RAPIDS MICH 10/3 AD- 862 506

Electrode Migration and Reaction Processes Occurring Within Alkaline-Zinc Batteries.

3

DESCRIPTIVE NOTE: Final rept. Dec 65-Sep 69, DEC 69 182P Dirkse, Thedford P.; CONTRACT: AF 33(615)-3292 PRGU: AF-8173 TASK: 817304

MONITOR: AFAPL TR-69-90

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*ALKALINE BATTERIES, ELECTRODES),

(\*ELECTRODES, \*ZINC), ELECTROCHEMISTRY, SURFACE ACTIVE
SUBSTANCES, IONS, MERCURY ALLOYS, ELECTROLYTES,
HYDROXIDES, POTASSIUM COMPOUNDS
IDENTIFIERS: NICKEL ZINC CELLS, POTASSIUM HYDROXIDE,
SILVER ZINC BATTERY CELLS, \*ZINC ALKALINE CELLS, ZINC
ELECTRODES, ZINCATE IONS

circulating the electrolyte at a modest rate was also cells and on the double layer capacitance of the zinc the zincate ion on this process has also been noted studied. In each case a literature reverw has also The open circuit, anodic, and cathodic behavior of the zinc electrode in KOH solutions have been been studied over a range of KOH concentrations at The cathodic behavior of zinc was studied by obtaining voltage-current curves in a range of KDH polarographic, cyclic voltammetric, potentiostatic and voltage decay measurements. This was done over a range of KOH concentrations with and without the amaigamation on these processes were also studied. active materials on the cycle life of silver-zinc The anodic zinc processes were observed by making been made. The open circuit behavior of zinc has presence of Zincate ions. The effect of surface electrode was measured. A few nickel-zinc cells concentrations and at temperatures of 0 to 50C. The effect of zincate ion and the effect of 25 and 44C. The effect of amalgamation and of were assembled and cycled. The effect of studied. (Author)

AD- 862 506

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UNCLASSIFIED

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

1-861 898 10/3 9/1 20/12 ATOMICS INTERNATIONAL CANGGA PARK CALIF AD- 861 898

Improved Cathode Systems for High-Energy Primary Batteries.

3

DESCRIPTIVE NOTE: Final rept. 1 Jul 68-30 Jun 69, OCT 69 53P Nicholson, Margie M.;

CONTRACT: F19628-67-C-0387 69 53P A1-69-71

AF-8659 865904 TASK:

MONITOR: AFCRL 69-0325

### UNCLASSIFIED REPORT

 $\widehat{\Xi}$ (\*CATHODES(ELECTROLYTIC CELL), \*SEMICONDUCTORS),
ELECTROLYTES, ANDDES(ELECTROLYTIC CELL), SINGLE
CRYSTALS, DOPING, YTTRIUM, ELECTRICAL RESISTANCE,
ELECTRIC CURRENTS, DENSITY, INTERFACES, REACTION
KINETICS, PURIFICATION, PORDUS MATERIALS, ORGANIC
COMPOUNDS, LITHIUM, CADMIUM COMPOUNDS, FLUORIDES,
SCANDIUM, MANGANESE COMPOUNDS, INDIUM ALLOYS, MERCURY
ALLOYS, LITHIUM COMPOUNDS, PERCHLORATES, PROPENES,
(ARBONATES) DESCRIPTORS: (\*PRIMARY BATTERIES, ENERGY),

3 confirmed by the observation of cadmium deposition at analogous procedures did not yield a conductive material. The cadmium fluoride crystals were characterized by the measurement of bulk and contact resistivities, using indium amalgam contacts. The crystal specimens were then examined electrochemically by cathodic discharge at constant current density in a lithium perchlorate - propylene organic electrolyte batteries by conversion of the active material to an electronic semiconductor was cadmium fluoride single crystals was prepared by a carbonate electrolyte. An electronic mechanism for two-stage high-temperature doping process. Initial undoped crystal was inactive when examined in the The improvement of cathode performance in primary investigated in this program. A series of n-type encountered in the use of semiconducting cadmium same electrode configuration. Two problems were efforts to prepare n-type manganous fluoride by the discharge of n-type cadmium fluoride was the semiconductor/electrolyte interface. An fluoride as a cathode material:

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY MALLORY (P R) AND CO INC BURLINGTON MASS LAB FOR PHYSICAL SCIENCE AD- 861 077

Diode Control Research.

3

DESCRIPTIVE NOTE: Final rept. May 66-15 Jul 69, Jul 69 429P Ball, James V. ; Pomerantz,

Daniel I.; CDNTRACT: AF 33(615)-3702 PROJ: AF-3145 TASK: 314522

MONITOR: AFAPL TR-69-81

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*SEMICONDUCTOR DIDDES, VOLTAGE REGULATORS), (\*ALKALINE BATTERIES, VOLTAGE REGULATORS), CONTROL SYSTEMS, LIMITERS, STORAGE BATTERIES, HEAT SINKS, MANUFACTURING, BATTERY CHARGERS IDENTIFIERS: NICKEL CADMIUM BATTERIES, SILVER ZINC BATTERY CELLS, SILVER CADMIUM CELLS, \*STABISTORS SUPPLEMENTARY NOTE: Continuation of contracts AF 33(657)-8749 and AF 33(615)-1342.

3 developed for specifying the stabistor diode area and the heat sink thermal resistance for a given cells. Stabistor diodes were shown to be stable, reliable, predictable, and capable of long life under quickly evaluating cells for use in stabistor-diode controlled batteries capable of high-rate (greater application. Stabistor diode applications include both steady heating thermal cycling. A method of charge control and voltage limiting of secondary Mathematical and graphical techniques were than C/2) charge was developed. (Author)

AD- 861 077

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YARDNEY ELECTRIC CORP NEW YORK

3 Maintenance-Free Silver-Cadmium Batteries for Aircraft Emergency Applications.

DESCRIPTIVE NOTE: Technical rept. no. 8 (Final), Jun 65-Aug 69,

AUG 69 92P Dalin, George; CONTRACT: AF 33(615)-2615 PROJ: AF-8173 TASK: 817304

MONITOR: AFAPL TR-69-65

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*AIRCRAFT EQUIPMENT, \*STORAGE BATTERIES), (\*ALKALINE BATTERIES, DESIGN), RELIABILITY(ELECTRONICS) CADMIUM, SILVER COMPOUNDS, HEAT SINKS, ELECTRODES (UIDENTIFIERS: SILVER OXIDES, \*SILVER CADMIUM CELLS (U

An emergency battery and a power conditioning system are described for use in connection with an aircraft electrical system. A 20-cell silvercadmium battery with a nominal capacity v. 22Ah at the 1 hour rate is described. It is charged from an aircraft bus which may be held by the aircraft's generators and voltage controllers at any voltage between 24 and 32. Each cell contains a platinumcatalyzed third electrode connected through a 5-ohm resistor to the cadmium negative of that cell. The third electrode recombines oxygen produced at the silver electrode at the end of charge. The power conditioner scans the cells and uses the magnitudes of the signals developed across the 5-ohm resistors discharging at 320 amps for 1 min. to aid in engine system thereby avoids the development of excessive pressure in any cell. The system is capable of by the recombination current to determine when to controlled heaters eliminate the effect of low temperature on performance. The battery serves as combination with the recombination electrode the starting and can reinsert up to 70% of nominal capacity in 20 minutes. Thermostatically terminate and to reinstitute charging. In a heat sink for the power conditioner. (Author)

#### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

GENERAL MOTORS CORP ANDERSON IND DELCO-REMY DIV

Silver-Zinc Electrodes and Separator Research.

3

DESCRIPTIVE NOTE: Technical rept. 30 Jun 67-30 Jun 69, JUN 69 420P Keralla, J. A. ; CONTRACT: AF 33(615)-3487

PROJ: AF-3145 TASK: 314522

MONITOR: AFAPL TR-69-57

### UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*ALKALINE BATTERIES, \*ELECTRODES), (\*STORAGE BATTERIES, BATTERY SEPARATORS), DESIGN, AEROSPACE CRAFT, FAILURE(ELECTRONICS), ZINC, SILVER, SURFACE AREA, CATHODES, AIR FORCE RESEARCH, PARTICLES, MEMBRANES, ORGANIC MATERIALS, STATISTICAL DATA, TEST DESCRIPTORS:

IDENTIFIERS: \*SILVER ZINC BATTERY CELLS

The objectives of the program are to provide design criteria for long life, light weight silver-zinc batteries for military aerospace applications. Effort is concentrated on the zinc electrode and separator since these are recognized as the major causes of premature failure of the silver-zinc battery. (Author)

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DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 859 690 10/3
BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS

Failure Mechanisms and Analyses of Sealed Batteries.

3

DESCRIPTIVE NOTE: Technical rept. 1 Feb 68-30 Apr 69, SEP 69 89 Reed, Allan H.; Cover, Paul

W. ; McCallum, John ;

MONITOR: AFAPL TR-69-74

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, RELIABILITY), ALKALINE BATTERIES, AIR FORCE EQUIPMENT, TEST METHODS, ELECTROCHEMISTRY, ELECTROLYTES, VISUAL INSPECTION, FAILURE(MECHANICS), ELECTRICAL PROPERTIES
IDENTIFIERS: \*FAILURE ANALYSIS, NICKEL CADMIUM BATTERIES, SEALED BATTERIES, SILVER ZINC BATTERY (U)

Results of tear-down analysis of uncycled nickelcadmium from four manufacturers are presented.
Analysis of the electrolyte extracted from the
cells shows that a significant amount of carbonate is
present in cells which have not been cycled.
Failure-analysis procedures have been developed for
nickel-cadmium and silver-zinc cells. Loss of
electrolyte was the major failure determinant in the
silver-zinc cells which were analyzed. A possible
mechanism by which loss of capacity can occur when
carbonate is produced during cell operation is
discussed. (Author)

#### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 859 446 10/2 10/3 MONSANTO RESEARCH CORP EVERETT MASS BOSTON LAB

Fuel Cell Battery, 60-watt Advanced Development Model.

3

DESCRIPTIVE NOTE: Final rept. 1 Feb 68-27 Jun 69, SEP 69 236P Salathe, Robert E.;

REPT. NO. MRB4040F CONTRACT: DA-28-043-AMC-01460(E)

PROJ: DA-1-T-622001-A-053 TASK: 1-T-622001-A-05304

MONITOR: ECOM 01460-F

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*FUEL CELLS, BATTERY COMPONENTS),
HYDRAZINE, AIR, PERFORMANCE(ENGINEERING), DESIGN,
ACCEPTABILITY, TESTS, VIBRATION, IMPACT TESTS, SHOCK
RESISTANCE, TEMPERATURE, HUMIDITY, ELECTROLYTES, POWER
SUPPLIES, MAINTENANCE, LIFE EXPECTANCY, NOISE, POTASSIUM
COMPOUNDS, HYDROXIDES, ALKALINE BATTERIES, (U)ALKALINE
BATTERIES

IDENTIFIERS: HYDRAZINE AIR FUEL CELLS, POTASSIUM
HYDROXIDE, POWER PACKS
(U)

An advanced development model of a 60-watt hydrazine-air fuel cell battery was designed, constructed, tested, and delivered. The fuel cell battery incorporated advanced concepts that yielded overall performance fully meeting contract requirements; a unit selected at random achieved a performance index rating of 1.065. Values of all major design parameters exceeded specified goals. This report describes the original and final design and the tests performed to assure compliance with contract technical requirements. (Author)

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AD- 859 446

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

- 859 386 10/3 7/4 CALIFORNIA UNIV BERKELEY SEA WATER CONVERSION LAB

Organic Electrolyte Permselective Membranes.

3

DESCRIPTIVE NOTE: Rept. no. 2 (Annual), 1 Apr 68-1 Dampier, F. W. ; Spiegler, K. 62P 69 Apr 69

CONTRACT: DAAB07-67-C-0590 PROJ: DA-1-T-061102-A-34-A 0590-2 ECOM MONITOR:

### UNCLASSIFIED REPORT

(\*BATTERY SEPARATORS, MEMBRANES), (\*MEMBRANES, TRANSPORT PROPERTIES), LITHIUM, COPPER COMPOUNDS, DIFFUSION, CHLORIDES, IONS, ELECTRODIALYSIS, ION EXCHANGE RESINS(U) IDENTIFIERS: DIOXANES, HIGH ENERGY BATTERIES, LITHIUM COPPER CHLORIDE CELLS, ??GANIC BATTERIES, \*PROPYLENE ( \*STORAGE BATTERIES, \*ORGANIC SOLVENTS), DESCRIPTORS: CARBONATE

in PC with moderate electrical resistance. A commercial laminar membrane was also tested and found specially prepared cation exchange membranes in half-molar lithium perchlorate-PC at 25C. In order to combine the advantages of cation selectivity and thin layer of pnenolsulfonic acid-formaldehyde cation low resistance, laminated membranes consisting of a This investigation is concerned with the evaluation of membrane separators for prevention of self discharge in the lithium-copper chloride-propylene carbonate (PC) cell. Measurements of electrical conductance were completed for six commercial and exchange resin on a polypropylene support were prepared. They were found to be chemically stable perchlorate through the membrane into pure PC was to be stable. The rate of diffusion of cupric found. (Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

1- 857 500 10/3 YARDNEY ELECTRIC CORP NEW YORK

Long Life Stable Zinc Electrodes for Alkaline Secondary Batteries.

3

DESCRIPTIVE NOTE: Rept. no. 8 (Final), Dec 66-Feb

Goodkin, G. ; McBreen, J. ; 71P 69 Dalin.G. : JUL

CONTRACT: DAAB07-67-C-0185 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662075-A-05302

### UNCLASSIFIED REPORT

0185-F

MONITOR:

9 3 (\*ALKALINE BATTERIES, ELECTRODES), ZINC, TEST METHODS, HYDROXIDES, SOLUBILITY, OXIDES, HALOCARBON PLASTICS, AGING(MATERIALS), FLUORINE COMPOUNDS, BINDERS IDENTIFIERS: CURING, POTASSIUM HYDROXIDE, TETRAFLUOROETHYLENE RESINS, TETRAFLUOROETHYLENE RESINS, ZINC OXIDE, \*ZINC ELECTRODES (\*STORAGE BATTERIES, \*ELECTRODES), DESCRIPTORS:

3 incorporation and proper cure of Teflon and from the use of extended edges and contouring of the zinc negatives. Cycle life in excess of five hundred negative with a cycle-life of at least 500, a number of structural, compositional, and operational variations were studied. In the realm of structure and composition, the variations studied were: Teflon concentration; Teflon cure With the principal objective of developing a zinc content; Cell size; Calcium hydroxide additive; Contoured negatives with and without superpressed periphery; and Use of fibers in dished center of plate and in the ZnO mix. The operational variations studied were: Charge cut-off voltage; and Long term wet stand. It was found that major Negatives wider and taller than positives; Zinc 62-1/2% depth of discharge cycles was obtained through the use of these modifications. temperature; Mercury content; Lead content; improvements in cycle life resulted from (Author)

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS Current-Density Effects in Single-Pore

Reed, Allan H. ; McCallum, DESCRIPTIVE NOTE: Technical rept., John

Electrodes.

AF 33(615)-3701 CONTRACT:

PROJ: AF-3145 TASK: 314522

AFAPL TR-69-38 MONITOR:

### UNCLASSIFIED REPORT

(\*CADMIUM, \*ELECTRODES), ELECTRIC CURRENTS, TEST METHODS, ELECTROCHEMISTRY, NICKEL, POROUS MATERIALS (U) IDENTIFIERS: CHARGE DENSITY, NICKEL CADMIUM BATTERIES, ( \* ALKALINE BATTERIES, ELECTRODES) POROUS ELECTRODES DESCRIPTORS:

Ξ from 1.0 to 26.0 milliampere-minutes over a period of 5 weeks. Analysis of the discharge current-potential-time data show that the major portion of considering the increased resistance to ionic current across a layer of cadmium hydroxide which uniformly operation the electrode capacity increased gradually simulate the negative electrode of a nickel-cadmium cell. During the course of charge-discharge cycle forms on the inside of the single-bore electrode. The consequences of this work to the improved A single-pore cadmium electrode has been used to the electrode polarization can be described by design of battery electrodes are discussed (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS 10/3

Failure Mechanisms in Sealed Batteries

3

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DESCRIPTIVE NOTE: Final technical rept. 1 Jul 66-30 McCallum, John ; Faust, Apr 69,

69 101P Charles .. ; NOO

CONTRACT: AF 33(615)-3701

PROJ: AF-8173 TASK: 817304

MONITOR: AFAPL TR-67-48-Pt-6

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Part 5 dated Apr 69, AD-851 056.

3 3 DESCRIPTORS: (\*ALKALINE BATTERIES,
FALURE(ELECTRONICS)), SATELLITES(ARTIFICIAL), TEST
METHODS, NICKEL, CADMIUM, SILVER, ZINC, ELECTROLYTES,
ELECTROCHEMISTRY, HEAT TRANSFER, ELECTRODES
IDENTIFIERS: NICKEL CADMIUM BATTERIES, SILVER ZINC
BATTERY CELLS, SPACECRAFT ELECTRIC POWER UNITS

nickel-cadmium cells are presented. After three eclipse seasons, three of the four original groups of analysis procedures were developed for nickel-cadmium and silver-zinc cells. These procedures have been approaches to accelerated life testing are reviewed. results of failure analyses coupled with the results of analyses of uncycled cells have yielded mathematical and physical models for predicting cell used to deduce failure determinants for cells which Of these components in the electrolyte is discussed thermal properties. A discussion of efficient cell and battery design is given. Chemical analyses Cells are still operating satisfactorily. Failure Measurements of electrolyte conductivity and freezing points of these solutions have also been Results of a continuing orbital test of sealed have been made on electrolytes containing KOH, made. The empirical, statistical and physical information about the increase in carbonate concentration in the electrolyte during cell failed during orbital testing programs. The operation. Thermal studies have developed K2C03, ZnO, and Ag2O. The interaction

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KD- 854 592

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS

Lithium Battery Research.

3

DESCRIPTIVE NOTE: Annual rept. no. 1, 1 Apr 68-31 Mar Semones, D. E. ; Tidwell, TR-69-48 CONTRACT: F33615-68-C-1282 Troy : McCallum, John ; 874 AFAPL PROJ: AF-3145 3

### UNCLASSIFIED REPORT

3 3 ESCRIPTORS: (\*LITHIUM, \*STORAGE BATTERIES), (\*ELECTROLYTES, STORAGE BATTERIES), SILVER COMPOUNDS, FLUORIDES, COPPER COMPOUNDS, CADMIUM COMPOUNDS, IDENTIFIERS: BATTERY ELECTROLYTES, CADMIUM CHLORIDE, COPPER(II) FLUORIDE, PROPYLENE CARBONATE, SILVER CHLORIDES, ORGANIC SOLVENTS FLUORIDE

3 in the fabrication program. This literature evaluation led to the identification of the need for first part of the present program included an evaluation of the existing literature and technology of lithium batteries. Applicable technology, components and electrodes were sought for later use seeks to identify rechargeable lithium-metal halide couples and electrolytes for use therein. The metal halides chosen from electrode screening work electrolyte that could supply the necessary halide evaluations were made of more than 30 metal halide compounds were studied in one or more electrolytes halide-electrolyte systems as promising candidates a rechargeable metal halide electrode in a stable ion for electrode reversibility. As a second part This report describes results of a program which compounds as active cathode materials. Eighteen for achieving rechargeable positive electrodes. These discoveries also required development of electrolytes for use in combination with the appropriate metal halide electrode. The three of this program, theoretical and experimental each. Results lead to discovery of five metal nonofluoride, AgF; (2) cupric fluoride, for continued study were: (1) silver

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS

Physical Properties and Chemical Analyses of Electrolytes for Sealed Silver-Zinc Batteries.

3

DESCRIPTIVE NOTE: Special technical rept. Jul 66-Mar A. , Jr.; Fleischer, A.; McCallum, J.; CONTRACT: AF 33(615)-3701

### UNCLASSIFIED REPORT

3 DENTIFIERS: BATTERY ELECTROLYTES, ELECTROLYTES, FUSED SALTS, POTASSIUM HYDROXIDE, SILVER OXIDES, SILVER ZINC BATTERY CELLS, ZINC OXIDES DESCRIPTORS: (\*ELECTROLYTES, \*ALKALINE BATTERIES), STORAGE BATTERIES, SILVER COMPOUNDS, ZINC COMPOUNDS, OXIDES, CARBONATES, ELECTRICAL CONDUCTIVITY, CHEMICAL PROPERTIES IDENTIFIERS:

3 a solution can be obtained by considering the volumes conductivity is decreased to about 80 percent of the percent KOH solutions shows that the volume of such Supercooling were observed in which solidification Electrolytes for sealed silver-zinc batteries have conductivity of pure 40 percent KDH. The addition of K2CD3 while keeping the potassium ion constant decreases the solubility of ZnO. These solutions require about 200 hours to reach steady state conditions. The conductivity of the electrolyte is decreased by the addition of 2no. The freezing points of ZnO-saturated 40 percent of solid ZnO and 40 percent KOH to be additive. been analyzed for KOH, ZnO, K2CO3, and Ag2O at -25, 0, 25, and 40 C. In such electrolytes the solubility of Ag2O is in pure KOH electrolytes. The addition of K2CO3 while keeping the potassium ion concentration K2CO3 were found to be similar to that of pure KOH; namely -37 C. Extreme instances of Conductivity. The density of Zn0-saturated 40 When 40 percent KOH is saturated with 2nd its Concentration constant further decreases the KOH solutions containing varying amounts of Sometimes did not occur at -65C. (Author)

AD- 853 490

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

GENERAL ELECTRIC CO SCHENECTADY N Y RESEARCH AND DEVELOPMENT CENTER AD- 853 037

Rechargeable Metal-Air Cell.

3

DESCRIPTIVE NOTE: Final rept. 1 May 67-30 Nov 68, APR 69 85P Hirsch, H. H. ; Mathewson, W. J. ; Moran, P. J. ; Ruzzo, J. C. ; Siwek, E.

REPT. NO. \$-69-1067 CONTRACT: DAMB07-67-C-0257 PROJ: DA-1-T-662075-A-05302 TASK: 1-T-662075-A-05302 0257-F MONITOR: ECOM

### UNCLASSIFIED REPORT

SUPPLIES), (\*STORAGE BATTERIES, \*ELECTRODES), AIR, ZINC, LEAD(METAL), CADMIUM, IRON OXIDES, ALKALINE BATTERIES, POTASSIUM COMPOUNDS, HYROXIDES, AMMONIUM COMPOUNDS, ELECTROLYTES, BATTERY SEPARATORS
IDENTIFIERS: AMMONIUM HYDROXIDE, CADMIUM AIR CELLS, 3 ( + COMMUNICATION AND RADIO SYSTEMS, POWER \*METAL AIR CELLS, POTASSIUM HYDROXIDE, ZINC AIR BATTERY CELLS, ZINC OXIDE DESCRIPTORS:

3 also been investigated with an air cathode and with a redox cathode. Design goals for the prototype battery include 500 continuous cycles at a discharge rate of C/5 with energy densities of 25 watt hours per pound at -40 dag F and 50 watt hours per pound at life is considered terminated when a given cell delivers less than 60 percent of alkaline electrolytes with zinc or cadmium anodes has been investigated. Lead in an acid electrolyte has military communications equipment. Zinc, lead, and systems would be included in a prototype metal-air development of a prototype rechargeable metal-air battery. An air electrode system as cperating in competitive basis so that one of the three anode cadmium anode systems have been considered on a battery for use as a power source for portable The program has been directed toward the its rated capacity. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY GENERAL TELEPHONE AND ELECTRONICS LABS INC BAYSIDE N Y BAYSIDE LAB

Evaluation of Ni-Fe and Ni-Zn Batteries.

3

DESCRIPTIVE NOTE: Rept. no. 2 (Final), 1 Nov 67-30 Blickwedel, T. W. CONTRACT: DAAB07-68-C-0102 PROJ: 0A-1-T-662705-A-053 1-T-662705-A-05302 46P Jan 69 TASK:

### UNCLASSIFIED REPORT

0102-F

ECOM

MONITOR:

See also Rept. no. 1, AD-840 SUPPLEMENTARY NOTE:

3 PERFORMANCE(ENGINEERING)), DESIGN, ELECTRODES, NICKEL, IRON, ZINC, THICKNESS, CONFIGURATION, BATTERY SEPARATORS, ELECTROLYTES, ADDITIVES, REGRESSION ANALYSIS, LIFE EXPECTANCY, SUBSTRATES IDENTIFIERS: \*NICKEL ZINC BATTERIES, \*NICKEL IRON DESCRIPTORS: (\*STORAGE BATTERIES, IDENTIFIERS: BATTERIES

3

3 designed experiments. Data analysis was performed by multiple linear regression techniques with the aid of a computer. (Author) electrode thickness, electrode geometry, separator type, electrolyte concentration and additives to the described. Parameters of cell construction such as A research program on the development and evaluation of Ni-Fe cells in the nickel-cadmium BB616( ),U case size and Ni-Zn cells in the silver zinc B8462( )/U case size is effect of these parameters on cell output characteristics were evaluated in factorially electrodes and electrolyte were studied. The

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SEARCH CONTROL NO. ZOMG7 DOC REPORT BIBLIDGRAPHY

NEW YORK UNIV BRONX DEPT OF CHEMICAL ENGINEERING

3 Electrode-Electrolyte Interactions Magnesium Anodes: .: Meta-Dinitrobenzene Cathodes.

DESCRIPTIVE NOTE: Semi-annual rept. no. 1, 1 Dec 67-30 Wikstrom, Leonard Lee ; 44P 89 Jun 68, 00

m DA-1-T-014501-A-34-A I-T-014501-A-34-A-00 DAAB07-68-C-CONTRACT:

## UNCLASSIFIED REPORT

0143-1

ECOM

3 3 DESCRIPTORS: (\*PRIMARY BATTERIES, ELECTRODES),
(\*MAGNESIUM, \*ANODES(ELECTROLYTIC CELL)),
(\*NITROBENZENES, CATHODES(ELECTROLYTIC CELL)),
ELECTROCHEMISTRY, ELECTROLYTES, PERCHLORATES, MAGNESIUM
COMPOUNDS, AMMONIUM PERCHLORATE, PHOSPHORIC ACIDS
IDENTIFIERS: AMMONIUM PHOSPHATES, BENZENE/DINITRO,
MAGNESIUM PERCHLORATE, ONGANIC BATTERIES

699.97% Mg and A.-21 Magnesium alloy);
h.e.r. on magnesium; electrochemical reduction of nitrobenzene, nitrosobenzene, phenylhydroxylamine, and meta-dinitrobenzene; and the electrochemical oxidation of nitrobenzene and phenylhydroxylamine in Mg(C104)2, NH4C104, (NH4)2HP04, and NH4C104-(NH4)2 HP04 have been circuit potential of magnesium in these electrolytes dinitrobenzene cell yielded very promising results. An open circuit voltage of 1.4 -1.6 volts and an energy density of 30 w-h/lb were obtained. The evolution and magnesium dissolution. A-size Mg/ magnesium perchlorate electrolyte-1-chloro-2,4is determined by the mixed process of hydrogen meta-dinitrobenzene cells were fabricated. The investigated. The data indicate that the open The electrochemical dissolution of magnesium 2M(Mg(C104)2 sat. with Mg(OH)2/.Chloro-2,4-dinitrobenzene, Mg/Sat. NH4C104--(NH4)2HPO4/meta-dinitrobenzene and Mg/ other cells were unsatisfactory. 0.10M NH4C104-0.45M (NH4)2HP04/

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

1- 85: 890 10/3 22/2 BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS

Heat Transfer in Sealed Nickel-Cadmium Spacecraft Cells and Batteries.

3

DESCRIPTIVE NOTE: Special technical rept., Mar-Dec 68, APR 69 66P Brooman.Eric W. :McCallum.

AF 33(615)-3701 CONTRACT: MONITOR: John :

AFAPL TR-69-21

UNCLASSIFIED REPORT

DESCRIPTORS:

DESCRIPTORS: (\*FUEL CELLS, HEAT TRANSFER), (\*STORAGE BATTERIES, HEAT TRANSFER), (\*SPACECRAFT, POWER SUPPLIES), THERMAL CONDUCTIVITY, MATERIALS, DESIGN, ELECTROLYTIC CELLS, ANALOG SYSTEMS, TEST METHODS, CORRELATION TECHNIQUES, ELECTRICAL

IDENTIFIERS: NICKEL CADMIUM BATTERIES, SEALED RESISTANCE

BATTERIES

3 3

3 Because heat transfer in sealed spacecraft cells is primarily by conduction, thermal resistance analog models of four types of nominal 20 amb-nr nickel—cadmium cells of different manufacture were used to predict the cell thermal properties as a function of the materials and types of construction.

Experiments were performed to verify the predictions and to obtain overall cell conductivities in directions parallel with, and perpendicular to, the plane of the plates. Studies were also made of the feasibility of measuring the conductivity of individual cell components. (Author)

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BBC REPORTS BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT	DOC REPORFEBIRE
AD- 851 056 10/3 BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS	AD- 850 003 UNION CARBIDE CC
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THE COUNTY OF THE STANDARD SELVEN STANDARD SELVEN STANDARD SELVEN	DESCRIPTIVE NOTE:
REPTONO HARMY TO TOUR (MH4) SHEDAY OUR WAY	Jul 66-1 Apr 68, MAR 69 87 CONTRACT: DA-28-0
MONITORING TO PERSON STATES OF THE STATES OF	PROJ: DA-1-T-6220 TASK: 1-T-622001-
defenued NOTASSTIED REPORTION Variation No.	MONITOR: ECOM
SUPPLEMENTARY NOTE: See also Part 45, Ab-834 300.	ond to ensiged
DESCAINTURS: (.ALKALINE BATTERIES.) FALLURE(EL ECTRONICS.) (*STORAGE BATTERIES.	DESCRIPTORS: (*P.
FALLURELECTRONICS), ELECTRODES, MANUFACIONING, DESIGN, CADMIUM, MICKEL, SILVER, ZINC, ELECTROLITES, HYDROXIDES, CARBONATES, CINC, COMPOUNDS, THERMAL	BATTERIES SEL
CONDUCTIVITY (U)	OXACLE OF COLUMN
HYDROXIDE, POTASSIUM CARBONATE, SILVER ZINC BATTERY (U)	76591878-427070 B
OHNAMIC BATTERIES	MnO2 primary bat
Fabrication	Property of the per un
or electrodes for alkaline hickel-cadmium and silver-	mechanism for co
undergoing life tests on simulated synchronous and colar orbitals are presented. Definitions of	battery compleme
failure, failure mode, failure determinant, and	PRC-25 battery
and for relevancy to failed cells and batteries. A	DE 36 70 Hours, The
revised failure analysis procedure to enable one to	dischange there
Cell'is recommended. Also, a procedure for more	directly with te
be complete cremical and physical analysis of sealed	Now of one cathode n
the contents of commercial cells. New experimental	COME WHY ID. YEE 3 (OF
mork to determine the STUBITITIES of Silver oxide,	apparently unner

(0)

RIMARY BATTERIES, \*MANGANESE), DESIGN, STORAGE, BATTERY COMPONENTS, ELECTRIC

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with, and perpendicular to,

4386/PRC-25 BATTERIES, MANGANESE(1V)

Types of nominal 20 amp-no nickel-

, noitoubr

nd 84-4386/PRC-25 magnes um-celle

resistance analog

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Technical rept. no. 1 (Final), 1

7P Urry, L. F.; 043-AMC-02565(E)

001-A-053

-A-05302 02565-F

POGRAPHY SEARCH CONTROL NO. ZOMOT

UNCLASSIFIED

DRP CLEVELAND OHIO CONSUMER PRODUCTS

BA-4270/U and BA-4386/PRC-

02 Primary Batteries.

(n) ,68 pag-0 (0) (0) unit weight, high temperature
ty, simplicity of design, and the
connecting cells. The BA-4270/U
40 hour output, while the BA-4386/ E
40 hour output, while the BA-4386/ E
70 comblement was reduced from 64 to 18
11 increase in service going from 60 hours
The whote efficiency and voltage of one cathode mix formulation, for example, was 62 ONE WHATE. of Cell compared to 44 WH/ID. at 70F and ONE WH/ID. at 30F 2 A parm oil coating is apparently unnecessary with the evolved cell designs, since it had no significant effect. (Author) ode mix formulation, were optimized BULLEFFE WEWDEIVE INZ. COLOWSOZ DHIO COFONSOZ TVBZ efore, the power density varies ystem increase with temperature of ttery designs including cell Heat Transfer in Sealed Nickel-Cadmium

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cells and their components are reported

AD- 45 PB 56 IBL TOCKYBHA

PAGE

9

conductivities, densities, and freezing points of electrolytes, containing KDH, K2CO3, Ag20, and ZnQ to simulate actual conditions within sealed silver-zing cells, is under way.

Measurements will be made at four temperatures from -25C to 40C. New thermal conductivity and resistance measurements of sealed nickel-cadmium

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SEVECH CONTROL NO. SOMOS

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

- 849 828 10/3 17/2 GOVERNMENTAL AFFAIRS INST WASHINGTON D C RESEARCH DIV 17/2

Manpack Vented Nickel-Cadmium Batteries, BB-500()/U, BB-607()/U, and BB-610()/

3

CONTRACT: DAAG39-69-C-0001 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302 10P JAN 69

### UNCLASSIFIED REPORT

TIR-30.9.1.14

MONITOR:

33 DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), PORTABLE EQUIPMENT, NICKEL, CADMIUM, COMMUNICATION EQUIPMENT IDENTIFIERS: NICKEL CADMIUM BATTERIES

3 This report describes three vented nickel-cadmium (Ni-Cd) batteries bein; developed to supply power to manpack communication equipment.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS

Failure Mechanisms in Sealed Batteries. Part IV.

3

DESCRIPTIVE NOTE: Semiannual technical rept. no. 4, 1 Jan-30 Jun 68, OCT 68

McCallum, John ; Faust, CONTRACT: AF 33(615)-3701 84P

AFAPL TR-67-48-Pt-4

MONITOR:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*DOCUMENTS, BATTERY COMPONENTS), (\*BATTERY COMPONENTS, LIFE EXPECTANCY), RELIABILITY(ELECTRONICS), FAILURE(ELECTRONICS), ALKALINE BATTERIES, NICKEL ALLOYS, CADMIUM ALLOYS, POWER SUPPLIES, THERMAL ANALYSIS, THERMAL CONDUCTIVITY, ELECTRIC DISCHARGES, ACCELERATED TESTING

IDENTIFIERS: NICKEL CADMIUM BATTERIES, SILVER ZINC
BATTERY CELLS

Work toward producing the first complete subject, author and facility index for the first 970 documents in the Battery Information Index is described. are briefly described. The merger of a collection of lithium battery documents into the present index is discussed. Recommendations for the selection of instrumentation for battery research, and development work and for the reporting of experimental procedures procedure is also given for complete cells in order to characterize them both physically and chemically. experiments under way serve as a reference point for have proceeded through the second eclipse season of characteristics of using a Flexowriter or computer This tear-down procedure, and the orbital cycling is given. As a precursor to making improved nickel-cadmium and silver-zinc cells, work has progressed toward fabricating nickel electrodes. Preliminary batches have been made. A tear-down improved designs. Presently all groups of cells It is to be produced by Flexowriter and a copy will be stored on punched tape, ready for any simulated orbital life tests and changes in computer processing anticipated. The electrical parameters are reported.

AD- 848 981

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ZOMO2

ZOM07 SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF 10/3

Evaluation Test Report for Eagle Picher 250 Ampere-Hour Battery, GD/A Part No. 55-06102-1,

3

Ilstrup, Marshall JAN 62 40P REPT. NO. GDA-55-A-1268 40P

### UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*STORAGE BATTERIES, RELIABILITY(ELECTRONICS)), VIBRATION, TEMPERATURE, LAUNCH VEHICLES, THERMAL STABILITY IDENTIFIERS: CENTAUR

 $\widehat{\Xi}$ and conclusions of the test results obtained during evaluation testing performed on a 250-ampere-hour Centaur main missile battary. This report contains the test procedures, test data

#### UNCLASSIFIED

ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

BURGESS BATTERY CO FREEPORT ILL

Development of Magnesium Wafer Cells.

3

DESCRIPTIVE NOTE: Final rept. Oct 67-Apr 68 Eaton, Lloyd W. ; CONTRACT: DA-28-043-AMC-02135(E) PROJ: DA-1-622001-A-053 TASK: 1-T-622001-A-05302 02135-F MONITOR: ECOM

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*MAGNESIUM, DRY BATTERIES), (\*DRY BATTERIES, GASES, PERCHLORATES, STORAGE, CORROSION INHIBITION, RUBBER IDENTIFIERS: GAS LEAKS, MAGNESIUM WAFER CELLS

33

3 This paper discusses the development of magnesium wafer cells. The principal physical condition causing constructional difficulties in both the 1-3/4 X 3-1/4 inch and 1-1/8 X 1-1/8 inch cell size batteries was the evolution of gas during storage and Prevent corrosion of the electrical contact area of particularly on the 1-1/8 X 1-1/8 inch cell size. A protective coating to prevent corrosion of the non-reactive side of the anode. was necessary to discharge. A revision in seal construction and moisture barrier size reduced the failure rate, the anode. (Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AMERICAN UNIV WASHINGTON D 846 063

3 Research on Electrochemical Energy Conversion Systems.

Nov DESCRIPTIVE NOTE: Semi-annual research rept. no. 5, Foley, Robert T. ; Taborek, Edward J. ; Bomkamp, Daryl H. 32P 67-May 68, NOV 68

CONTRACT: DA-44-009-AMC-1386(T) DA-1-T-061102-A-34-A PROJ:

1-T-061102-A-34-A-00

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*ELECTRIC PROPULSION, POWER SUPPLIES), (\*PRIMARY BATTERIES, DESIGN), ENERGY CONVERSION, ELECTROCHEMISTRY, ELECTROLYTES, LITHIUM COMPOUNDS, PERCHLORATES, OXYGEN HETEROCYCLIC COMPOUNDS, KETONES, ELECTRODES, PLATINUM, OXYGEN, REDUCTION(CHEMISTRY), MATHEMATICAL ANALYSIS, PERFORMANCE (ENGINEERING),

SIMULATION IDENTIFIERS: LITHIUM PERCHLORATE, \*METAL AIR BATTERIES, PROPYLENE CARBONATES

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improved electrochemical energy conversion systems for vehicle propulsion. The first is related to the lithium-air cell, specifically the reduction of oxygen at a platinum electrode in 1 M LiClod solution in propylene carbonate. The second task reported on deals with the mathematical treatment of battery data. The testing of a battery to simulate simulation of vehicle propulsion wherein the battery This report describes work on two tasks related to an 8-hour excursion at various load profiles is is associated with a 30 KW prime power source. described. The treatment is extended to the

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SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

GOVERNMENTAL AFFAIRS INST WASHINGTON D C RESEARCH DIV AD- 845 914

Vented Nickel-Cadmium Battery, BB-501()/

3

Technical information rept. DESCRIPTIVE NOTE:

CONTRACT: DAAG39-69-C-0001 PROJ: DA-1-T-622705-A-053 99 NOV 68

TIR-30.9.1.15 TASK: 1-T-662705-A-05302 MONITOR: AMC

### UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*ALKALINE BATTERIES, DESIGN), ELECTRODES, NICKEL, CADMIUM, COMMUNICATION EQUIPMENT, POWER SUPPLIES, BATTERY COMPARTMENTS, ELECTRICAL PROPERTIES, REVIEWS

IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

detached power source for communication equipment. Consisting of 20 BB-613()/U cells wired in two 12-volt blocks and housed in a common battery Voltage selection is accomplished by a special connector that connects the two cell blocks, in parallel for 12 volts or in series for 24 volts. The battery case has been designed so that it can also house the BB-356()/U sealed Ni-Cd, U sealed Cd-AgO, BB-573()/U vented Cd-AgO, and BB-537()/U vented Zn-AgO cells in 12- or 24-volt packages. hours at 12 volts or 14 ampere-hours at 24 volts. box, the BB-501()/U can deliver 28.0 ampere-The BB-501()/U is intended for use as a

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(Author)

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UNCLASSIFIED AD- 846 063

ZOMOZ DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

1- 845 244 10/2 7/4 ATOMICS INTERNATIONAL CANDGA PARK CALIF AD- 845 244

Improved Cathode Systems for High-Energy Primary Batteries,

Nicholson, M. M. ; AI-68-93, Scientific-1 F19628-67-C-0387 486 CONTRACT

PROJ: AF-8659

MONITOR: AFCRL 68-0205

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, CATHODES(ELECTROLYTIC CELL), SEMICONDUCTORS, VACUUM APPARATUS, ELECTROLYTES, ELECTROCHEMISTRY, PURIFICATION, ANODES(ELECTROLYTIC CELL), ELECTROLYTIC CELL), ELECTROLYTIC CELLS, ENERGY, DOPING, CADMIUM COMPOUNDS, FLUORIDES, ELECTRICAL CONDUCTIVITY, ELECTRIC DISCHARGES, LITHIUM COMPOUNDS, PERCHLORATES, CARBONABCANIC SOLVENTS, PROPE IS, EFFICIENCY, YTTRIUM, CARBON BLACK, POLARIZATION, PELLETS, SINGLE CRYSTALS (U) PROPYLENE CARBONATE

3 fluoride was chosen as a model cathode system for the corresponding utilization efficiency for the undoped material was not more than 10%. The This research is concerned with the influence of electronic conductivity on the performance of high-energy battery cathode systems. Because of its cadmium fluoride was discharged with 43% utilization at 2 ma/sq cm in a lithium perchlorate-propylene carbonate electrolyte, while the availability as an n-type semi-conductor, cadmium 20% carbon black. In solid state conductivity measurements it was found that pressure contacts, including those of carbon, did not produce obmic electrical connections to cadmium fluoride. conventional powered cathode mixtures containing initial study. Yttrium-doped cadmium-treated electrochemical results were obtained with

#### UNCLASSIFIED

SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

)- 843 822 10/3 9/6 GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF

Telemetering Battery Primary Type Missileborne Dwg. No. 27-06358, Flight Proofing Test Report for

3

3

Lamoureux, T. , Jr; GDA-27A896R 34P 61 REPT. NO.

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*TELEMETER SYSTEMS, GUIDED MISSILE
BATTERIES), (\*PRIMARY BATTERIES,
PERFORMANCE(ENGINEERING)), MAINTENANCE, OPERATION,
LEAKAGE(FLUID), FAILURE, ELECTROLYTES, VOLTAGE, BATTERY
COMPONENTS, ELECTRIC BATTERIES, THERMAL STABILITY, HIGH
ALTITUDE, HUMIDITY, VIBRATION, RESONANT FREQUENCY DESCRIPTORS:

3 The purpose of the report is to describe the test equipment and procedure required for the flight proofing of five telemetering batteries.

UNCLASSIFIED

AD- 845 244

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT Design of Standard Line of Vented Silver-AD- 843 503

Hawkins, B. R. ; Carr, E. DESCRIPTIVE NOTE: Final rept. Jan 67-Aug 68, 34P 68

Zinc Batteries.

CONTRACT: DAAB07-67-C-0216 PROJ: DA-1-T-622001-A-053 TASK: 1-T-622001-A-05302

0216-F ECOM MONITOR:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), (\*ALKALINE BATTERIES, DESIGN), ELECTRODES, SILVER, ZINC, CONTAINERS, SEALS, ELECTRICAL PROPERTIES, ENVIRONMENTAL TESTS, LIFE EXPECTANCY (U)

3 Ø addition to meeting the specification requirements, batteries. Testing of the batteries included cycle testing which has been successfully completed. In Secondary zinc-silver oxide batteries of optimized manufactured and tested per Specification SCL-6870 which represents versatile performance for silver-zinc secondary batteries. Lot Acceptance Testing has been completed and reported with all four (4) cell sizes successfully passing the requirements of the technical specification. Visualization data was submitted to USAECDM as well as engineering drawings for the four (4) substantial weight reduction was accomplished. design were developed. The batteries were (Author)

#### UNCLASSIFIED

ZOMOZ DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF 10/3 AD- 843 185

Evaluation Test Report for Light Weight TLM Battery CVA P/N 27-06348-1.

3

3

Hamblen, L. GDA-27A788R 61 REPT. NO.

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### UNCLASSIFIED REPORT

PERFORMANCE(ENGINEERING)), PRIMARY BATTERIES, SILVER, ZINC, CONTAINERS, STAINLESS STEEL, HEATERS, PRESSURE REGULATORS, VALVES, VOLTAGE, HUMIDITY, BAROMETRIC PRESSURE, ACCELERATION, VIBRATION IDENTIFIERS: EVALUATION, STEEL 1050 (\*GUIDED MISSILE BATTERIES, DESCRIPTORS:

33

3 consists of primary silver-zinc ceils with interconnecting lugs, stainless steel container, thermostatically controlled heater, power receptacle, pressure relief valve and pressurizing valve. The test specimen covered by this procedure (Author)

AD- 843 185

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ZOMO2

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 843 175 10/3
GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF

Flight Proofing Test Report for the Airborne Optical Beacon Battery (Light Weight Version) Dwg. No. 27-04526 (BAC) Part No. 10-20411-2.

MAR 61 71P Gilbert, J. K.; REPT. NO. GDA-27A897R

### UNCLASSIFIED REPORT

Availability: Microfiche copies only.

DESCRIPTORS: (\*GuIDED MISSILE BATTERIES,
PERFORMANCE(ENGINEERING)), OPTICAL EQUIPMENT, BEACONS,
RADIO INTERFERENCE, VOLTAGE, LEAKAGE(FLUID), FLECTRICAL
RESISTANCE
IDENTIFIERS: ELECTRICAL LOADING
(U)

The report describes the flight proof testing of airborne optical beacon batteries. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 842 795 10/3 GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF TLM Battery Reliability Search for Critical Weakness R.T.O. 725 Spec. 27-06358.

3

AUG 60 33P Bogardus,C.; REPT. NO. GDA-27A792

3

### UNCLASSIFIED REPORT

Availability: Microfiche copies only.
DESCRIPTORS: (\*GUIDED MISSILE BATTERIES, RELIABILITY),
TELEMETER SYSTEMS, ACCELERATION, VIBRATION, HIGH
ALTITUDE, THERMAL STABILITY, VOLTAGE, ELECTRICAL
RESISTANCE, ELECTRIC TERMINALS

A reliability test, was performed on twenty (20) telemeter batteries. The report documents the results of the test.

3

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AD- 843 175

AD- 842 795

PAGE

UNCLASSIFIED

TEN

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF AD- 842 783

Flight Proofing Test Report for TLM Remotely Activated 'D' Series Cook Battery, Dwg. No. 27-06358-1.

3

Andrews, H. D. REPT. NO. GDA-27A739

### UNCLASSIFIED REPORT

3 Availability: Microfiche copies only.
DESCRIPTORS: (\*GUIDED MISSILE BATTERIES,
PERFORMANCE(ENGINEERING)), SURFACE TO SURFACE MISSILES,
THERMAL STABILITY, VOLTAGE, OPERATION, CURVE FITTING, IDENTIFIERS: ATLAS, XSM-65D MISSILES TABLES(DATA)

The report gives a summary of the results obtained during the flight proofing test of the telemetering battery, remotely activated 'D' series.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

HONEYWELL INC MONTGOMERYVILLE PA LIVINGSTON ELECTRONIC AD- 842 472

3 10-Watt Liquid Ammonia Battery Design and Development.

DESCRIPTIVE NOTE: Final rept. 28 Nov 66-28 Nov 67, AUG 68 126P Sykes, Bernard ; AUG 68 126P SYL CONTRACT: F30602-67-C-0087 PROJ: AF-5592 TASK: 559203

TR-68-135 RADC MONITOR:

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*PRIMARY BATTERIES, DESIGN), AMMONIA, ELECTROCHEMISTRY, CONFIGURATION, ELECTRICAL PROPERTIES, ELECTRIC DISCHARGES, CATHODES(ELECTROLYTIC CELL), BATTERY SEPARATORS, ELECTROLYTES, ORGANIC MATERIALS, NITROBENZENES

3 \*AMMONIA ACTIVATED BATTERIES, BATTERY I DENTIFIERS: DISCHARGES

65F to +125F) under a discharge schedule calling for nine-minute discharge at a 50-milliampere drain and one minute at the 314-milliampere drain rate. Improvements accomplished in basic cell demonstrated capacities involved readjustment of the cathode formulations and physical structure, together volumes and configuration dictated a concentration of 6 ammonia battery systems at this stage of development nonaqueous systems in terms of substantially greater and indicate desirability of evaluating alternative A program of development having as principal objectives the extension of previously established ammonia tattery capabilities and the adaptation of such chemistries involved to specific requirements effort in review and modification on a basic cell level. Significant progress was made with final test data indicating discharge life capability of with the introduction of more durable separation increased output from batteries of established hours at 314-milliampere drain rate (from design which were principally responsible for membranes. Results show practical limits for was conducted. The need for a significantly

AD- 842 472

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UNCLASSIFIED

energy capabilities.

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 842 167 10/3 16/4
GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF

FLIGHT PROOF TEST REPORT FOR REMOTELY ACTIVATED RANGE SAFETY COMMAND BATTERY, COOK ELECTRIC COMPANY, DWG. NO. 27-06360-1,

3

JUL 60 26P Smith,R. J. REPT. NO. GDA-27A706

### UNCLASSIFIED REPORT

Availability: Microfiche copies only.

DESCRIPTORS: ("GUIDED MISSILE BATTERIES,
PERFORMANCE(ENGINEERING)), PRIMARY BATTERIES,
LEAKAGE(FLUID), VOLTAGE, THERMAL STABILITY, HIGH
ALTITUDE, HUMIDITY, VIBRATION, ACCELERATION, OPERATION,
LIFE EXPECTANCY, GUIDED MISSILES
(U

The purpose of the report is to describe the test equipment and environmental test procedure required for the flight proofing of remotely activated range safety command batteries.

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

4D- 842 132 10/3 16/4 GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF

PET-DR 27A677-00076 PRODUCTION EVALUATION TEST REPORT FOR YARDNEY MAIN MISSILE BATTERY, CVA P/N 27-06359, QC DOCUMENT 27QC-14018A,

3

MAY 60 BP Barber, A. D. REPT, NG. 3DA-27A677-00076

### UNCLASSIFIED REPORT

Availability: Microfiche copies only.
DESCRIPTORS: (\*GUIDED MISSILE BATTERIES,
PERFORMANCE(ENGINEERING)), TELEMETER SYSTEMS, VIBRATION,
HIGH ALTITUDE, HUMIDITY, THERMAL STABILITY
IDENTIFIERS: EVALUATION, TOLERANCES(ELECTRICAL) (U)

The report documents the results obtained when a main missile battery was tested.

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#### UNCLASSIFIED

ZOW0Z SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

- 841 957 10/3 16/4 GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF AD- 841 957

PRODUCTION EVALUATION TEST REPORT FOR BATTERY, STROBE-LIGHT, PRIMARY, MISSILEBORNE, DWG. 27-06190-1,

Barber, A. D. 60 26F GDA-27A559-R REPT. NO.

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*GUIDED MISSILE BATTERIES, RELIABILITY(ELECTRONICS)), PRIMARY BATTERIES, TOLERANCES(MECHANICS), VIBRATION, RESONANT FREQUENCY, ELECTRICAL RESISTANCE, ELECTRIC DISCHARGES, THERMAL STABILITY

3

3 This report describes the test equipment and procedure required for the production evaluation of missileborne strobe-light batteries.

#### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

- 841 898 10/3 16/4.2 GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF AD- 841 898

3 FLIGHT PROOFING TEST REPORT FOR THE TLM REMOTELY ACTIVATED D-SERIES COOK-BATTERY DWG. NO. 27-06358-1,

Barber, A. D. 60 35P GDA-27A357-R REPT. NO.

3

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*SURFACE TO SURFACE MISSILES, GUIDED MISSILE BATTERIES), (\*GUIDED MISSILE BATTERIES, RELIABILITY(ELECTRONICS)), TOLERANCES(MECHANICS), THERMAL SHOCK, THERMAL STABILITY, HIGH ALTITUDE, VIBRATION, RESONANT FREQUENCY IDENTIFIERS: ATLAS, XSM-65D MISSILES

33

This report defines equipment and procedures utilized in flight proof-testing of missileborne telemeter batteries.

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

D- 841 893 10/3 16/4
GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF

FLIGHT PRODFING TEST REPORT FOR REMOTELY ACTIVATED D-SERIES RANGE SAFETY COMMAND BATTERY (COOK), DWG. NO. 27-06360-1, (U)

APR 60 26P Barber, A. D. REPT. NO. GDA-274490-R

### UNCLASSIFIED REPORT

Availability: microfiche copies only.

DESCRIPTORS: (\*Guided Missile Batteries,
PERFORMANCE(ENGINEERING)), PRIMARY BATTERIES,
LEAKAGE(FLUID), VOLTAGE, THERMAL STABILITY, HIGH
ALTITUDE, HUMIDITY, VIBRATION, ACCELERATION, OPERATION,
LIFE EXPECTANCY, Guided Missiles

The purpose of the report is to describe the test equipment and environmental test procedure required for the flight proofin, of remotely activated batteries.

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

- 841 650 10/3 ESB INC MADISON WIS RAY-O-VAC DIV DEVELOPMENT OF MAGNESIUM FLAT CELL BATTERY.

3

DESCRIPTIVE NOTE: Final rept. no. 6, 1 Nov 67-30 Jun

CONTRACT: DA-28-043-AMC-02136(E)
PROJ: DA-1-T-622001-A-053
TASK: 1-T-622001-A-05302

MONITOR: ECOM 02136-F

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, DESIGN), DRY
BATTERIES, ELECTRODES, MAGNESIUM, MANGANESE COMPOUNDS,
DIOXIDES; CAPACITANCE, STORAGE, MOISTURE, ENCAPSULATI (U)
IDENTIFIERS: \*MAGNESIUM WAFER CELLS, MANGANESE(IV)
OXIDE

A review of development work during the 24 month contract plus a more detailed discussion of the past 8 months work is presented. Initial and delayed BA-4399 capacity results, capacity maintenance and percent moisture loss figures on flat cell batteries are included. Particular emphasis was placed on capacity and capacity maintenance of batteries after storage at 130F and 160F for 1 to 3 months. Methods of improving capacity maintenance and reducing moisture loss after these storage conditions are described. Design investigations on several larger size flat cells for use in the BA-4386 battery are given, including initial and delayed capacity figures. Battery design was completed using NS size flat cells in the BA-4386 battery, and initial capacity results are reported.

3

(Author)

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AD- 841 650

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#### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

5-841 130 10/3 21/3 STANDARD GIL CO (OHIO) CLEVELAND RESEARCH AND DEVELOPMENT

DEVELOPMENT OF ELECTROCHEMICAL ENERGY STORAGE UNIT FOR VEHICLE PROPULSION.

DESCRIPTIVE NOTE: Final technical rept. 3 Mar 66-30 Sprague, James W. ; SOHIO-TR-3690 DA-44-009-AMC-1531(T) 51P 89 REPT. NO. Jun 68. 00

### UNCLASSIFIED REPORT

CONTRACT:

33 DESCRIPTORS: (\*ELECTRIC PROPULSION, STORAGE BATTERIES), (\*STORAGE BATTERIES, DESIGN), CATHODES(ELECTROLYTIC CELL), CARBON, ANDDES(ELECTROLYTIC CELL), LITHIUM ALLOYS, ALUMINUM ALLOYS, ELECTROLYTES, LITHIUM COMPOUNDS, POTASSIUM COMPOUNDS, CHLORIDES, ELECTRICAL PROPERTIES, LIFE EXPECTANCY, ADDITIVES, (U)

DENTIFIERS: MOLTEN ELECTROLYTE BATTERIES

3 which would exemplify the design principles. The cathode packing factor has been increased from 2.1 cu in/lb. Cells, which contained a proprietary additive, showed an increase in energy content from 2.5-3.5 WH/cu in of cathode by a design of a basic energy storage unit, and to loan to the government preprototype state-of-the-art cells successfully for 13 cycles without the assistance of containing cells also released over 50% of their energy content above 2.5V compared to 2% for the from the base carbon cathode ceils and operated base cells. A five-cell series stack was built The objective of the program was to verify the factor of about 1.3 to 1.4. The additive auxiliary devices. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT DESIGN OF STANDARD LINE OF VENTED SILVER-ZINC AD- 840 560 BATTERIES

3

DESCRIPTIVE NOTE: Acceptance test rept. 10 Jun 67-29 Feb 68,

Hawkins, B. R. ; Carr, E. CONTRACT: DAAB07-67-C-0216 PROJ: DA-1-T-622001-A-053 TASK: 1-T-622001-A-05302 24P SEP 38

### UNCLASSIFIED REPORT

0216-4A

MONITOR: ECOM

33 DESCRIPTORS: (\*ALKALINE BATTERIES, DESIGN), (\*STORAGE BATTERIES, DESIGN), DRY BATTERIES, ELECTRODES, SILVER, ZINC, PERFORMANCE(ENGINEERING), ENVIRONMENTAL TESTS, IDENTIFIERS: SILVER ZINC BATTERY CELLS LEAKAGE (ELECTRICAL) DESCRIPTORS:

for the vented series of secondary silver-zinc batteries as described by SCL-6870A. Forty (40) dry uncharged batteries of each capacity have been forwarded to the USAECOM as a result of this testing. This acceptance testing included capacity, -20F, high rate, environmental and charge retention tests for the BB-462()/U, BB-464()/U, and BB-465( seven (7) days, the batteries met specification requirements but it was noted that the cells would the varied requirements of this specification. Lot acceptance testing has been successfully completed batteries. The design is deemed satisfactory for versatile performance for silver-zinc secondary destructive test. After exposure to 160F for )/U. It has been determined that the 160F, 7 day charge retention test is essentially a The Specification SCL-6870A represents

3

short-out within ten (10) cycles. (Author)

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

GOVERNMENTAL AFFAIRS INST WASHINGTON D C RESEARCH DIV AD- 840 361

30-WATT LITHIUM HYDRIDE FUEL CELL.

3

TIR-30.9.1.5 CONTRACT: DAAG39-69-C-0001 PROJ: DA-1-T-662705-A-053 MONITOR:

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*FUEL CELLS, DESIGN), LITHIUM COMPOUNDS, HYDRIDES, HYDROGEN, STORAGE BATTERIES, ELECTRICAL (()

 $\Xi$ The US Army Electronics Command is developing a lithium hydride fuel cell that will silently recharge a storage battery used to power forward-area tactical communication and surveillance equipment. The system is called the fuel cell—battery hybrid. The fuel cell, which is connected in parallel to the battery, converts chemical energy formed by a lithium hydride tablet and water in a Kipp-type symbiotic relationship allows the battery to be small enough for a man to carry in a pack. The power output of the combination is 30 watts, with a nominal charge of 14 and 28 volts for 240 ampere-hours per charge of fuel. A 0.45-ampere-hour storage battery is thus able to supply the peak-power pulses of some transmitters without an unduly rapid drain of power. ~ The battery life in this combination is approximately 42C cycles, a cycle considered to be minutes transmitting and 18 minutes receiving time for a given radio in the PRC-VRC series. hydrogen generator to electric energy. This

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SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

GENERAL TELEPHONE AND ELECTRONICS LABS INC BAYSIDE 10/2 AD- 840 290

EVALUATION OF NI-FE AND NI-ZN BATTERIES

3

DESCRIPTIVE NOTE: Semiannual rept. no. 1, 1 Nov 67-30 Blickwedel, T. W. Apr 68,

REPT. NO. TR-68-831.6 CONTRACT: DAABO7-68-C-0102 PROJ: DA-1-T-662705-A-05302 TASK: 1-T-662705-A-05302

### UNCLASSIFIED REPORT

0102-1

MONITOR: ECOM

DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), FLECTRODES, NICKEL, IRON, ZINC, THICKNESS, CONFIGURATION, BATTERY SEPARATORS, ELECTROLYTES, ADDITIVES, PERFORMANCE(ENGINEERING), REGRESSION ANALYSIS

NICKEL ZINC CELLS IDENTIFIERS:

33

thickness, electrode geometry, separator type, electrolyte concentration, and electrolyte additives on the cell output characteristics are being Data analysis is being performed by multiple linear regression techniques via computer. Three experiments are described showing the significant effects of variables studies. These experiments indicate that the minimum energy density goals of 12.5 Wh/lb for Ni-Fe and 22 Wh/lb for Ni-Zn (at C/5 and 80F) can be exceeded in these Work is described concerning the design and initial evaluation of Ni-Fe cells in the nickel-cadmium BB616( )/U size and Ni-Zn cells in the silver-zinc BR462( )/U size. The effect of Darameters of cell construction such as electrode evaluated in factorially designed experiments.

3

cell sizes. (Author)

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AD- 840 290

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

- 840 076 10/3 TECHNICAL OPERATIONS INC BURLINGTON MASS

FABRICATION OF ULTRATHIN SOLID ELECTROLYTE BATTERIES.

3

DESCRIPTIVE NOTE: Rept. no. 4 (Final), 1 Apr 67-31 Mar 68,

Vouros, P. ; Clune, J. ; ro-8-68-31 Masters, J REPT. NO.

DAAB07-67-C-0339 0339-F CONTRACT: MONITOR:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, \*MINIATURE ELECTRICAL EQUIPMENT), ELECTROLYTES, ELECTRODES, FILMS, VAPOR PLATING, VACUUM APPARATUS, SPUTTERING, SILVER, GOLD, PLATINUM, SILVER COMPOUNDS, POTASSIUM COMPOUNDS, CHLORIDES, BROMIDES, IODIDES, STORAGE BATTERIES, LIFE EXPECTANCY, (U)LIFE EXPECTANCY (U) CHLORIDE, SILVER IODIDE

feasibility of preparing solid-electrolyte batteries using only vacuum-deposited thin films. This feasibility has been demonstrated. Batteries were made in two configurations (nonoverlapping and overlapping electrodes). In all cases the anode material was an evaporated Ag film; a variety of electrolytes were studied (evaporated AgI, codouble electrolyte of AgI evaporated onto a film iodizing a thin film of Ag previously evaporated Au. Overall cell thicknesses were in the range of 6-12 microns. Preliminary tests indicate that The objective of this study was to determine the onto a film of sputtered Pt); cathode materials were sputtered Pt films (usually) or evaporated of evaporated AgC1, a double electrolyte of AgI evaporated onto a film of AgI prepared by such thin cells are rechargeable and some are evaporated AgI and KI, evaporated AgBr, a apparently of long shelf-life. (Author)

#### UNCLASSIF1ED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

1-839 883 10/3 GENERAL MOTORS CORP ANDERSON IND DELCO-REMY DIV

3 SILVER-ZINC ELECTRODES AND SEPARATOR RESEARCH.

DESCRIPTIVE NOTE: Technical rept.,

Keralla, J. A.; SEP 68 158P K4 CONTRACT: AF 33(615)-3487

PROJ: AF-3145 TASK: 314522

MONITOR: AFAPL TR-68-115

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*ALKALINE BATTERIES, MATERIALS), PRIMARY BATTERIES, ELECTRODES, SILVER, ZINC, BATTERY SEPARATORS, SURFACE ACTIVE SUBSTANCES, EPOXY RESINS, LEAD(METAL), ZINC COMPOUNDS, OXIDES, IRON, CALCIUM OXIDES, MEMBRANES, POROSITY, POLYETHYLENE PLASTICS, ACRYLIC RESINS (LIDENTIFIERS: POLYOXYETHYLENE, SILVER ZINC BATTERY (L

3

9 Polyethylene glycols in a molecular weight range 1000 give comparable cycle life with tridecyloxy poly(ethyleneoxy)ethanols. It is surmised that

evidence of pore sizes of various separator membranes have been found through electron microscope studies. the polyethyleneoxide structure is active in promoting cycle life. The addition of .25% Pb in ZnO tends to reduce agglomeration of the formed zinc and to prolong cycle life. The limit of .010% Fe in ZnO is tolerable for satisfactory cycle life. The use of CaO in the negative material to produce insoluble sites for zincate stoppage is not satisfactory. Some

is not practical in terms of redesigning the present precrosslinked polyethylene base, radiation grafted Increasing the stoichiometric ratio of formed zinc methacrylic acid membrane is suitable for use as a cell because of increased volume with a small separator in secondary silver-zinc batteries. increase in cycle life. The 90 Mrad

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(Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS 10/3

3 FAILURE MECHANISMS AND ACCELERATED LIFE TESTS FOR BATTERIES,

McCallum, John ; Thomas, 97P

:Roeger, Earl W. , Jr: BAT-7770-S-3 AF 33(615)-3701 Ralph E. REPT. NO. CONTRACT:

### UNCLASSIFIED REPORT

TR-68-83

AFAPL

MONITOR:

DESCRIPTORS: (\*SIGRAGE BATTERIES, RELIABILITY), LIFE EXPECTANCY, ACCELERATED TESTING, FAILURE, DEGRADATION, STRESSES, TEMPERATURE, VOLTAGE, FAILURE(MECHANICS), PRESSURE, CORRELATION TECHNIQUES, STATISTICAL ANALYSIS, MATHEMATICAL MODELS

 $\widehat{\Xi}$ framework, including definitions of terms and methods of analysis, for accelerated life tests of batteries. In Part I, the principal methods suitable for analysis of accelerated test data are reviewed and within-cycle quality, degradation of quality between classified as empirical, statistical, or physical. voltage quality, and pressure quality of a battery within a charge or discharge cycle. The physical concepts which underlie these definitions are temperature, voltage, gas pressure, and mechanical definitions of the following terms for batteries: stress. Each stress is subject to control through correlation between failure mechanisms and stress cycles, stress factor, and failure. Quantitative measures are given for the temperature quality, discussed in Part III in an attempt to provide a levels for accelerated life tests. Four stresses for an accelerated test are suggested to be the control of an appropriate strain or rate of strain, either externally or internally to the Strengths and weaknesses of each approach are This report consists of a general conceptual recommended. Part II consists of specific indicated. The use of three approaches is battery. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

GULTON INDUSTRIES INC METUCHEN N J ALKALINE BATTERY 10/3 AD- 836 554

LITHIUM-NICKEL FLUORIDE SECONDARY BATTERY INVESTIGATION.

3

DESCRIPTIVE NOTE: Final rept. 27 Apr 66-27 Apr 68, JUL 3 283P Lyall, Arthur E.; Seiger,

Harvey N. ;Orshich, John ; REPT. NO. AB-2830 CONTRACT: AF 33(615)-3488

AFAPL TR-68-71 MONITOR:

### UNCLASSIFIED REPORT

3 3 ( \*ALKALINE BATTERIES, EXPERIMENTAL DATA), STORAGE BATTERIES, ELECTROLYTES, ANODES(ELECTROLYTIC CELL), CATHODES(ELECTROLYTIC CELL), LITHIUM, NICKEL COMPOUNDS, FLUORIDES, CARBON, POLARIZATION IDENTIFIERS: GRAPHS(CHARTS), \*LITHIUM-NICKEL FLUORIDE CELLS, NICKEL FLUORIDE, PHOSPHORUS POTASSIUM HEXAFLUORIDE, PROPYLENE CARBONATE DESCRIPTORS:

conductivity at infinite dilution, are given for most distribution so it has the greatest electrochemical fourth section contains the conclusions. Those are that propylene carbonate with potassium greatest effect on the surface areas and pore size particularly those to be used with nickel fluoride cathode. Conductivity, viscosity, and equivalent performance are given for a variety of electrode and extender, as well as various types of nickel fluoride were used. The third section contains conductivity carbon produced the best electrode. mixes. Variations of conductive diluent, binder, hexafluorophosphate is still the most practical section deals with the nickel fluoride cathode. first contains the data on electrolyte studies, This report is divided into four sections. The of the solute-solvent combinations. The second Data on porosity, pore size distribution, true Surface area (by the BET method) and electrode chronopotentiometric tests are presented. The electrolyte. The conductive diluent has the effect on the electrode. Conductex, a high cell testing data. Automatic cycling and

AD- 838 775

(Author)

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

- 835 219 10/3 BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS AD- 835 219

3 MEASUREMENTS OF QUANTITIES WHICH CHANGE IN BATTERY PERFORMANCE AND ANALYSIS.

DESCRIPTIVE NOTE: Special technical rept., JUN 68 441 Linebrink, O. L. ; Semones, L. :McCallum, John ; NO. BAT-7770-S-1 RACT: AF 33(615)-3701

CONTRACT:

MONITOR: AFAPL TR-68-34 AF-8173 817304 PROJ:

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*BATTERY COMPONENTS, STATE-OF-THE-ART REVIEWS), RELIABILITY(ELECTRONICS), ALKALINE BATTERIES, STORAGE BATTERIES, PASSIVE SYSTEMS, FAILURE(ELECTRONICS), VOLTAGE, ELECTRIC CURRENTS, TEMPERATURE, MEASUREMENT, ANALYSIS, ELECTRICAL IMPEDANCE, LEAKAGE(ELECTRICAL), GAS GENERATING SYSTEMS, PULSE GENERATORS, TEST METHODS, PREDICTIONS, (U) PREDICTIONS DESCRIPTORS:

3 measurement of power, electrode surface analysis, and a coulometric internal short test. (Author) literature from the viewpoint of the techniques used also presents recommendations for the development of examination of the techniques reported has led to recommendations for more complete reporting of the needed specific passivation studies, current pulse experimental and instrumental details. The report to make measurements and to acquire data. An relationships to the state of charge, direct This report results from a survey of battery

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

1-834 903 10/2 10/3 PITTSBURGH UNIV WASHINGTON D C RESEARCH STAFF

ZINC-AIR HYBRID FUEL CELLS.

3

DESCRIPTIVE NOTE: Technical information rept. 7P 89 MAY

CONTRACT: DA-49-186-AMC-214(D) TIR-30.9.1.7 PROJ: DA-11622001A053 TASK: 17622001A053-02 AMC MONITOR:

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), (\*FUEL CELLS, DESIGN), ZINC, POTASSIUM COMPOUNDS, HYDROXIDES, FLECTROLYTES, TRANSMITTER RECEIVERS, VOLTAGE, ELECTRIC DISCHARGES, ANDDES(ELECTROLYTIC CELL), CATHODES(ELECTROLYTIC CELL), AIR, POWER SUPPLIES (\*IDENTIFIERS: AN/PRC-41, AN/PRC-47, \*HYBRID FUEL CELLS, \*ZINC AIR BATTERY CELLS

3 the anodes and electrolyte, the batteries will supply a nominal 24 volts for a life of approximately 1,000 hours in 20- and 48-ampere-hour models. One increasing the airflow to supply peak pulse power is required. The other model will provide power over rates during extended transmission periods, a blower version is designed to power radios with high drain the radio application, the battery has successfully powered both AN/PRC-47 and AN/PRC-41 radios. they have the characteristics of a fuel cell and a battery, are being developed for use with forwardarea tactical communication and surveillance equipment. Mechanically rechargeable by replacing longer periods to relatively low-drain equipment, Two zinc-air fuel cells, labeled hybrid because Matching standard storage batteries in size and models are being fabricated in battery form for such as surveillance and countermeasure sets. width, the zinc-air cells vary in height to accommodate the different-size cells. Several laboratory and field testing. (Author)

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO-COLUMBUS LABS

THE THERMAL PROPERTIES AND BEHAVIOR OF NICKEL-CADMIUM AND SILVER-ZINC CELLS AND THEIR COMPONENTS.

Brooman, Eric W. ; Mccallum, DESCRIPTIVE NOTE: Special technical rept., 114P 68 MAY

REPT. NO. John

BATT-7770-4 AF 33(615)-3701 AFAPL CONTRACT:

### UNCLASSIFIED REPORT

TR-68-41

3 3 DESCRIPTORS: (\*ALKALINE BATTERIES, THERMAL PROPERTIES), NICKEL, CADMIUM, SILVER, ZINC, ELECTRODES, CAPACITANCE, THERMAL CONDUCTIVITY, REVIEWS, BIBLIOGRAPHIES, PERFORMANCE(ENGINEERING), MATHEMATICAL MODELS, HEAT TRANSFER, ELECTRIC DISCHARGES, HEATING (U) IDENTIFIERS: \*NICKEL CADMIUM CELLS, \*SILVER ZINC

BATTERY CELLS

properties of nickel-cadmium and silver-zinc cells was collected and summarized. Methods of optimizing the thermal properties and dimensions of such cells and batteries are given. Formulae are derived to describe the heat balance of two types of

thermal models, one a homogeneous (thermally

certain conditions, of heat losses through the lead wires is stressed. Such losses may be large enough to help assure that temperature rise during discharge network analog model is also given which reveals that high thermal resistance (low ability to dissipate isotropic), system; the other a thermally anisotropic system which resembles more closely the the heat generated) is largely associated with the gas gaps inside the cells, and the poor thermal conductivity of the cell case material. Examples is reasonable. A thermal resistance-capacitance actual cells in question. The importance, under

of a thermal time constant is introduced as a are given of how this high thermal resistance may be measure of the rute of change of internal cell temperatures, and the ability to dissipate the heat to improve operational performance. The reduced concept

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

BOEING CO SEATTLE WASH

3 SHOCK AND VIBRATION TESTS ON ELECTRIC STORAGE BATTERY COMPANY LEAD-ACID BATTERIES,

Smith, R. H. 22P 60 22P D2-9110 REPT. NO.

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*GUIDED MISSILE BATTERIES,
PERFORMANCE(ENGINEERING)), STORAGE BATTERIES, SURFACE TO
SURFACE MISSILES, CONTROL SYSTEMS, CONTAINERS,
TRANSPARENT PANELS, PLASTICS, FAILURE(MECHANICS),
RELIABILITY, REDUNDANT COMPONENTS
IDENTIFIERS: LGM-30 MISSILES, MINUTEMAN, MINUTEMAN 1

3

MISSILES

3

3 were conducted to determine whether lead-acid batteries of this design would meet the Minuteman shock and vibration requirements. (Author) The document covers shock and vibration tests on stationary type lead-acid batteries under consideration for use as emengency power in the Minuteman launch control system. These tests

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

16/4.2 BOEING CO SEATTLE WASH 10/3 AD- 832 538

SHOCK AND VIBRATION TESTS ON C AND D BATTERIES, INC., LEAD-ACID BATTERIES, WS 133A,

Smith, R. H. 45P 02-9111 REPT. NO.

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*GUIDED MISSILE BATTERIES, RELIABILITY), STORAGE BATTERIES, SURFACE TO SURFACE MISSILES, ENVIRONMENTAL TESTS, SHOCK RESISTANCE, VIBRATION, LAUNCHING, CONTROL SYSTEMS, CONTAINERS, IMPACT SHOCK, PLASTICS, STEEL, ACCEPTABILITY, REDUNDANT COMPONENTS (U) IDENTIFIERS: \*LEAD ACID CELLS, LGM-30 MISSILES, (U)

3 tests were conducted to determine whether lead-acid The contractor conducted shock and vibration tests batteries of this design would meet the Minuteman on stationary type lead-reid batteries under consideration for use as emergency power in the shock and vibration requirements. (Author) Minuteman Launch Control System. These

#### UNCLASSIFIED

ZOMO2 SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

16/4.2 BOEING CO SEATTLE WASH 10/3 AD- 832 535

SHOCK AND VIBRATION TESTS ON GOULD-NATIONAL BATTERIES, INC., LEAD-ACID BATTERIES,

3

Smith, R. H. 28P 02-7991 REPT. NO. OCT

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*GUIDED MISSILE BATTERIES, RELIABILITY), STORAGE BATTERIES, SURFACE TO SURFACE MISSILES, ENVIRONMENTAL TESTS, SHOCK RESISTANCE, IMPACT SHOCK, VIBRATION, LAUNCHING, CONTAINCA SYSTEMS, PLASTICS, CONTAINERS, ACCEPTABILITY, REDUNDANT COMPONENTS IDENTIFIERS: \*LEAD ACID CELLS, LGM-30 MISSILES, MINUTEMAN, MINUTEMAN 1 MISSILES

Shock and vibration tests were conducted on stationary type lead-acid batteries under consideration for use as emergency power in the

3 facilitate the tests as well as obtain information of tests were conducted to determine whether lead-acid representative battery cells on a no-charge basis. batteries of this design would meet the Minuteman shock and vibration requirements. In order to importance, three manufacturers submitted Minuteman Launch Control System. These (Author)

AD- 832 538

ZOM07 SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS 10/3 AD- 831 437

3 FAILURE MECHANISMS IN SEALED BATTERIES.

DESCRIPTIVE NOTE: Semiannual technical rept. no. 3, Jul-31 Dec 67,

McCallum, John ; Faust, 791 Charles L. :

BAT-7770-3 REPT. NO.

AFAPL TR-67-48-Pt-3 AF 33(615)-3701 CONTRACT:

### UNCLASSIFIED REPORT

PESCRIPTORS: (\*BATTERY COMPONENTS, LIFE EXPECTANCY), FAILURE(ELECTRONICS), PREDICTIONS, DATA STORAGE SYSTEMS, SUBJECT INDEXING, INFORMATION REIRIEVAL, ABSTRACTS, ELECTRODES, PREPARATION, PERFORMANCE(ENGINEERING), SATELLITES(ARTIFICIAL), POWER SUPPLIES, ORBITS, SIMULATION, ALKALINE BATTERIES, SILVER, ZINC, TEST METHODS, STANDARDIZATION, HEAT TRANSFER, (U)HEAT 33 TRANSFER

IDENTIFIERS: SILVER ZINC BATTERY CELLS

data, and with handling choices are circulated to the engineers. A following interview with an information specialist provides a flexible but united transfer studies proposed that battery temperatures can be predicted or explained on the basis of thermal battery information is being developed by engineers having a variety of technical interests. Monthly accessions lists with abstracts, with descriptive coefficients of generalized physical stress-strain correlate battery degradation with changes in the variables, (b) describes equipment and processes preliminary data on simulated orbital tests, and A system for storing, indexing, and retrieving an electrode-making facility, (c) records (d) suggests a failure analysis procedure for relationships. A section on thermal and heat system for individuals. This report also (a) recommends improved measurements of battery capacitancerresistance networks. (Author) Accelerated Life Tests is attempting to silver-zinc cells. Theoretical work on for

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

CHEMICAL AND METALLURGICAL RESEARCH INC CHATTANDOGA 10/3 AD- 829 289

SURVEY AND ANALYSIS ON METAL-AIR CELLS.

3

DESCRIPTIVE NOTE: Technical rept. (Final), 20 Jan 66-4 Jan 68,

Fleischer, Arthur; 68 MAR

CONTRACT: AF 33(615)-3527

PROJ: AF-3145 TASK: 314522

MONITOR: AFAPL TR-68-6

### UNCLASSIFIED REPORT

33 BATTERIES, REVIEWS), ELECTROCHEMISTRY,
ANODES(ELECTROLYTIC CELL), CATHODES(ELECTROLYTIC CELL),
MATERIALS, ELECTROLYTES, MAGNESIUM, ZINC, AIR, DXYGEN,
ALUMINUM, CHROMIUM, MANGANESE, CATALYSTS, ELECTRICAL DESCRIPTORS: (\*PRIMARY BATTERIES, REVIEWS), (\*STORAGE PROPERTIES.

ZINC AIR BATTERY CELLS IDENTIFIERS:

electrodes for fuel cells has led to a re-examination indicated that zinc and magnesium are the most likely anode materials for primary cells with aluminum, Door performance of air cathodes in such electrolytes densities than presently available will depend on the continued support of the manufacture of batteries for of the possibilities of metal-air systems in primary lead for use in acid electrolytes is hampered by the fulfillment of operable batteries with higher energy chromium, and manganese offering interesting possibilities for research. For secondary cells, zinc has the lead with cadmium as a contender for cells of high reliability; iron, cobalt, and nickel preferably other than platinum metals, and towards Examination of the basic technology, all possible and secondary batteries of high energy densities. has reached a crucial stage where the promise of Offer research possibilities. The development of at ambient temperatures. Cathodes of lower cost must be achieved by research for new catalysts, the achievement of longer life. The development anodes, cathodes, and aqueous electrolytes has The recent development of thin durable oxygen testing in the field and in the laboratory.

AD- 829 289

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY 1- 825 241 10/3 MALLORY (P R) AND CO INC BURLINGTON MASS LAB FOR PHYSICAL AD- 825 241 SCIENCE

3 EVALUATION OF RECHARGEABLE LITHIUM-COPPER CHLORIDE ORGANIC ELECTROLYTE BATTERY SYSTEM.

Dey, A. N. ; Rao, M. DESCRIPTIVE NOTE: Final rept. Mar-Oct 67 69P NOV 67

DA-44-009-AMC-1537(T) CONTRACT:

### UNCLASSIFIED REPORT

3 PERFORMANCE(ENGINEERING)), ANODES(ELECTROLYTIC CELL), LITHIUM, CATHODES(ELECTROLYTIC CELL), COPPER COMPOUNDS, CHLORIDES, ELECTROLYTES, ORGANIC MATERIALS, SOLVENTS, MEMBRANES, ION EXCHANGE RESINS, ELECTROOSMOSIS, COMPATIBILITY, COMPLEX COMPOUNDS

(U)

IDENTIFIERS: COPPER CHLORIDE—LITHIUM CELLS, ORGANIC ( \*STCRAGE BATTERIES, DESCRIPTORS:

discharges rapidly due to the formation of highly soluble chlorocuprate complexes (e.g. CuCl3(-), cuCl2(-), etc.). The feasibility of using ion-exchange membranes as separators to retard the diffusion of chlorocuprate complexes was demonstrated by studying the transference of the counter ions and the self diffusion properties of counter ions and the co-ions of the membranes in

) through a cation exchange membrane was found to be 0.98, and the diffusive flux of the Li(+) was could be decreas 3 from 0.2 ma/sq cm to 0.1 micro-a/ membrane. The various problems associated with the organic electrolyte battery systems were studied. found to be 10 to 100 times faster than that of butyrolactone. The transference number of Li(+ An extensive evaluation was carried out on a variety of commercially available ion-exchange use of ion-exchange membranes as separators in system. These studies showed that the self-discharge current density of a Li/CuCl2 cell CuC13(-) through the same cation exchange membranes with reference to the Li/CuC12

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

57 NOT STANDARD OIL CO (OHIO) CLEVELAND RESEARCH AND DEVELOPMENT AD- 825 167 DEPT

3 DEVELOPMENT OF ELECTROCHEMICAL ENERGY STORAGE UNIT FOR VEHICLE PROPULSION.

DESCRIPTIVE NOTE: Final technical rept. 30 Jun 66-30 Anderson, R. A. ; Firestone, R. F. ; Hacha, T. H. ; Rightmire, R. A. ; 63P 67 Sep 67,

Selover, T. B. , Jr; PT. NO. SOHIO-6615-2 REPT. NO.

### UNCLASSIFIED REPORT

DA-44-009-AMC-1843(T)

33 DESCRIPTORS: (\*ELECTRIC PROPULSION, POWER SUPPLIES), (\*STORAGE BATTERIES, DESIGN), CATHODES(ELECTROLYTIC CELL), CARBON, ANODES(ELECTROLYTIC CELL), LITHIUM ALLOYS, ALUMINUM ALLOYS, ELECTROLYTES, LITHIUM COMPOUNDS, POTASSIUM COMPOUNDS, CHURIDES, SIMULATION, BATTERY SEPARATORS, ELECTRICAL PROPERTIES IDENTIFIERS: MOLTEN ELECTROLYTE BATTERIES

3

BATTERIES

3 contained and operates in the temperature range from designed for maximum energy density and deliver 6 to 355 to 550C. The electrochemical principles of the battery have been fully verified and prototype cells have been delivered to the Government which made usi g computer simulation techniques. This design is based on the Sohio secondary battery which has a solid lithium-aluminum anode, carbon demonstrate the principles. These cells were not A 'paper' design of a 100 WH/1b battery has been cathode, and fused lithium chloride-potassium chloride electrolyte. The battery is self-8 WH/1b. (Author)

AD- 825 167

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AD- 825 241

separator.

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sq cm by the use of an ion-exchange membrane

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

GLOBE-UNION INC MILWAUKEE WIS APPLIED RESEARCH LABS 10/3 AD- 823 679

LITHIUM-MOIST AIR BATTERY

3

DESCRIPTIVE NOTE: Final rept. Mar 66-Jul 67 JUL 67 39P Toni, Jorge E. A. ; Zwaagstra, R. L.; CONTRACT: DA-44-009-AMC-1552(T) PROJ: DA-1C622001A012

1C622001A01202

### UNCLASSIFIED REPORT

SCHOLL PIORS: (\*STORAGE BATTERIES, \*LITHIUM), FEASIBILITY STUDIES, MOISTURE, ELECTROLYTES, ELECTRODES, ELECTROCHEMISTRY, PERCHLORATES, AMINES, AMMONIUM COMPOUNDS, FLUORIDES, PHOSPHATES, ADSORPTION, REACTION KINETICS, IONS, DIFFUSION, AIR

3 electrode processes are complex; adsorption effects directed to the characterization of the performance and silver in non-aqueous media. Linear and cyclic nitrosodimethylamine systems. The mechanism of the The principal objective of this program is the study of the feasibility of the lithium-moist air high energy storage battery for use as the power system in vehicles. The primary effort was of the air electrode in non-aqueous electrolytes. Oxygen has been found to be reducible on platinum platinum electrodes for the lithium perchlorateswee; voltammetry have been used to study the electrochemical reduction of oxygen on smooth and chemical kinetics complications have been phenyltrimethylammonium hexafluorophosphate nitrosodimethylamine (NDA) and determined.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

LEESONA CORP GREAT NECK N Y LEESONA MOOS LABS DIV ZINC/AIR HIGH ENERGY DENSITY RECHARGEABLE ENERGY 10/3 STORAGE SYSTEM.

3

DESCRIPTIVE NOTE: Final rept. 6 Jan-6 Sep 66, DEC 66 56P Katsoulis,E. G.;Vertes,M CONTRACT: DA-44-009-AMC-1469(T) A. ;Alfradson,K.

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*ALKALINE BATTERIES, VEHICLES), (\*ZINC, \*ELECTRODES), (\*STORAGE BATTERIES, ALKALINE BATTERIES), AIR COOLED, PROPULSION SYSTEMS, STORAGE BATTERIES, POTASSIUM COMPOUNDS, HYDROXIDES, ELECTRICAL PROPERTIES, VOLTAGE, ELECTRIC CURRENTS, HEAT TRANSFER, OXYGEN, ELECTROLYTIC CELLS

3 and tradeoffs of both modes of heat removal under the parameters of zinc/air cells is presented. Revised estimates of non-zinc component weights indicate that water evaporative cooling, described the advantages evaluate the recharging parameters and to determine Electrically rechargeable zinc/air cells, of the static electrolyte type, were cycled under varying charge and discharge rates and air flow rates to intended operating conditions. A discussion of the the energy density of a 10 kW-hr zinc/air battery discharged and charged at the 10 hour a.,d 4 hour interdependence of operating, measured and system thermal analysis, considering convective air and rates, respectively, will be 83 watt-hours/ib. Critical areas of heat and mass transfer. A (Author)

AD- 823 679

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# SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

- 821 051 10/3 7/4 LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF LOCKHEED PALO ALTO RESEARCH LAB

LITHIUM-ANDDE LIMITED CYCLE BATTERY

INVESTIGATION

3

DESCRIPTIVE NOTE: Final rept. 1 Jan 66-1 Jun 67, Jul 67 75P Bauman, H. F. ;Chilton, J. E. ; Hultquist, A. E. ; EPT. NO. LMSC-M-89-67-4 DNTRACT: AF 33(615)-2455 REPT. NO.

MONITOR: AFAPL TR-67-104 CONTRACT TASK:

### UNCLASSIFIED REPORT

(\*PRIMARY BATTERIES, MANUFACTURING), (\*STORAGE BATTERIES, MANUFACTURING), (\*COPPER COMPOUNDS, CATHODES(ELECTROLYTIC CELL)), ENERGY CONVERSION, ELECTROCHEMISTRY, ELECTROLYTES, PROPENES, CARBONATES, LITHIUM COMPOUNDS, PERCHLORATES, INFRARED SPECTROSCOPY, BATTERY SEPARATORS, POLARIZATION, ELECTRIC DISCHARGES, DESCRIPTORS: (\*LITHIUM, \*ANODES(ELECTROLYTIC CELL)), COPPER(II) FLUORIDE TEMPERATURE, VOLTAGE IDENTIFIERS:

This program was concerned with the development of technology required to build batteries based on the lithium-cupric fluoride and lithium-cobaltic fluoride electrochemical couples. All experimental work electrolyte have discharged for 140 hr above the 2.0directed toward increasing the utilization of Cupric fluoride couple with a lithium perchlorate-propylene discharge capabilities of the cathode in laboratory cells and in assembled batteries. A relationship was found between wet stand life, discharge current density, and the water present in the cell system. Cells in which the water content of the Components fluoride in the cathode structure and improving the has been reduced discharge with a plateau at about 2.5 V at a current density of 1.5 mA/sq in. remove water from the cathodes, separators, and Cells in which special techniques were used to during this period was with the lithium-cupric V level at a current density of 1.5 mA/sq in. carbonate electrolyte. The major effort was after 130 days of wet stand.

#### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

GENERAL MOTORS CORP ANDERSON IND DELCO-REMY DIV 10/3

SILVER-ZINC ELECTRODES AND SEPARATOR RESEARCH.

3

DESCRIPTIVE NOTE: Annual technical rept. no. 1, AUG 67 209P Lander. J. J. : Keralla.J. Lander, J. J. ; Keralla, J AUG 67

CONTRACT: AF 33(615)-3487

PROJ: AF-3145 TASK: 314522

AFAPL TR-67-107 MONITOR:

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*SILVER, \*ZINC), (\*BATTERY COMPONENTS, FLECTROCHEMISTRY), REDUCTION, WEIGHT, FAILURE (ELECTRONICS), LIFE EXPECTANCY, PARTICLE SIZE, FIBERS, ASBESTOS, ELECTRIC DISCHARGES, OXIDES, ELECTROLYTES, SOLUBILITY, SULFONIC ACIDS, LIGNIN, CELLULOSE, SURFACE ACTIVE SUBSTANCES, POLYETHYLENE PLASTICS, CRYSTAL STRUCTURE, ALKALINE BATTERIES, CROSSLINKING (CHEMISTRY), ELECTRODES, (U) ELECTRODES IDENTIFIERS: AGGLOMERATION, LIGNIN SULFONATE, SILVER ZINC BATTERY CELLS

choice for use in the zinc negative material found to cycle life at room temperature but is detrimental to the negative mix is helpful to negative plate cycle life. The use of cotton fibers helps to maintain the negative plate active material in place during Ethanol in the negative material helps cell cycle appear to help negative plate cycle life. The use date. However, at cold temperatures, surfactants percentages of acicular ZnO mixed with Kadox-15 cold (30-40 F) operation. The best electrolyte to date at 60% depth-of-discharge is 50% KDH Additions of 1.2% to 2% lignosulfonic acid in cycle life. The surfactant BC-610 is the best appear to inhibit cycle life. The use of .1% of 2% to 5% ZnSO4 aids the negative plate life as well as surfactant FC-95. Small yielding 220 cycles. (Author)

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AD- 819 967

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ZOMOZ

PAGE

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

3 GENERAL MOTORS CORP INDIANAPOLIS IND ALLISON DIV LI-CL2 PRIMARY BATTERY INVESTIGATION AD- 819 543

DESCRIPTIVE NOTE: Final technical rept. 1 Jul 66-30 AUG 67 136P Petraits, John J. ; Craig, Gale M. ; Swinkles, Dom A. ; Hietbrink, Earl H.

AF 33(615)-5343 EDR-5291 REPT. NO. CONTRACT:

AF-3145 PROJ:

AFAPL TR-67-89 TASK: 314522 MONITOR:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, ACCEPTABILITY), (\*LITHIUM COMPOUNDS, \*CHLORIDES), POLARIZATION, THICKNESS, DENSITY, ELETRODES, ELECTROCHEMISTRY, IMPURITIES, PRESSURE, I.STRUMENTATION, WETTING, GRAVITY, GAS ANALYSIS, CONTROL SYSTEMS, IONS, GRAPHITE, HEAT SINKS, TEMPERATURE, TEST METHODS (U) 33 DENTIFIERS: LITHIUM CHLORIDE

3 densities up to 300 w-hr/lb and 13.5 w-hr/cu in. were obtained with power densities near 20 w/sq cm found above 27 w/sq cm were obtained for periods exceeding 30 min with a peak power density of 43 w/sq cm with the C12 electrode at 1/16-in, and 1/8-in. thickness, pressure to 5 atm, and C12 purity levels to 99.9%. Current densities up to 11 to 12 amp/sq cm were demonstrated with polarizations of 0.4 v. Eleven high power density laboratory ceils were tested at pressures up to 3 atm. Power densities The higher energy and power density potentials of the Li-C12 couple were investigated to determine its applicability to advanced weapon requirements. electrode can be predicted and that the resulting performance is sufficient to permit the design demonstrated. Analytical system studies were also Concentration polarization tests were completed completed to evaluate the effects of design and operational parameters r Li-C12 battery weight (greater than 30 min) batteries. This program has shown that the polarization at the C12 to be most satisfactory for short discharge and volume characteristics. Battery energy

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

10/3

AD- 813 731

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS

3 FAILURE MECHANISMS IN SEALED BATTERIES

DESCRIPTIVE NOTE: Semiannual technical summary rept. no. 1, 30 Jun-31 Dec 66, McCallum, John ; Faust, Charles L.; Beatty, G. H.; Brooman, E. W.;

Hardy, W. R. :

CONTRACT: AF 33(615)-3701

AFAPL TR-67-48 TASK: 817304 MONITOR:

## UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*ALKALINE BATTERIES, QUALITY CONTROL),
REVIEWS, SPACEBORNE, SIMULATION, NICKEL, CADMIUM.
SILVER, ZINC, TEST METHODS, LIFE EXPECTANCY, ELECTRICAL
PROPERTIES, TEST FACILITIES, ACCELERATED TESTING,
THERMAL PROPERTIES, SOLUBILITY

This report outlines a new program toward acquiring Simulating charge-discharge conditions for orbiting batteries is described. Experimental programs are suggested for finding new ways: (1) to store, retrieve, and use battery literature, (2) to measure quantities that change as batteries age or an understanding of battery failure mechanisms for silver solubilities, to recommend accelerated life Ohio, a capability for conducting failure analysis are used, (3) to improve monitoring of batteries, (4) to make electrodes, cells, or cell components, (5) to provide failure analysis on batteries. During this report period, work commenced on all the above objectives, excepting procedures, and (6) to explain failure mechanisms. Additional objectives are to measure (6) - new ways to explain failure mechanisms. alkaline spacecraft batteries. Apparatus for tests, to describe thermal and heat transfer Major emphasis was given to objectives (1), (2), and (3) – literature, measurement, and monitoring, but no specific work items were properties, and to provide within the Aero Propulsion Laboratory of the U.S. Air Force at Wright-Patterson Air Force Base,

AD- 813 731

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SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS

 $\hat{\boldsymbol{\varepsilon}}$ INVESTIGATION OF POROUS LITHIUM BATTERY ELECTRODES.

DESCRIPTIVE NOTE: Final technical rept. 15 Jul 65-15

McCallum, John ; Semones, D. 170P FEB 67 Nov 66.

BAT-7344-F AF 33(615)-2619 E. : Faust, Charles L. ; REPT. NO.

AF-8173 CONTRACT: PROJ:

TR-67-13 MONITOR: AFAPL 817304

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, ELECTRODES), LITHIUM, ELECTROLYTES, PROPENES, POLARIZATION, STORAGE BATTERIES, AIRCRAFT, SPACECRAFT, ANODES, ALKALI METALS, ELECTRICAL RESISTANCE, OXIDATION, DETSITY, VOLTAGE, CARBONATES, CHLORIDES, ELECTRICAL CONDUCTIVITY, CADMIUM, PERFORMANCE(ENGINEERING), LIFE EXPECTANCY, WEIGHT (U)

3 extablished the principles for designing rechargeable lithium electrodes having thin and inert supports with lithium when both types were discharged at about impregnation, this work has shown ways to minimize weights and to maximize the energy per unit of weight. The best electrodes required 8.0 g/whr for a nonporous foil-supported electrode and 9.5 g/whr for a porous electrode support partially impregnated or this resistance was found to be the allowance of to be nonadherent and to act as inert material that that are either porous or nonporous. Using organic charge/discharge cycles over a period of about one week without signs of failure. At the same time, a mportant parameter. The best means to compensate electrolytes saturated with lithium chloride, the ithium chloride. This lithium chloride was found expansion spacing for oxidation products such as a 1.3 hour rate. The electrodes yielded up to 12 electrolyte resistance was found to be the most tends to constrict electrolyte conductivity. By need for a more stable electrolyte was clearly using inert porous substrates with partial [heoretical and experimental studies have dentified. By comparison,

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

AD- 806 812 10/3 AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB

3 ELECTROLYTE CARBONATE CONTAMINATION VERSUS ELECTRICAL PERFORMANCE OF SINTERED PLATE NICKEL-CADMIUM AIRCRAFT BATTERIES.

DESCRIPTIVE NOTE: Summary rept. Apr 65-Jan 66, Marsh, Richard A. ;

SEP 66 39P N REPT. NO. AFAPL-TR-66-58 PROJ: AF-8173 TASK: 817304

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, CONTAMINATION),
AIRCRAFT EQUIPMENT, AIR, CARBONATES, CARBON DIOXIDE,
NICKEL, CADMIUM, ELECTRICAL PROPERTIES, EFFECTIVENESS,
SPECIFICATIONS, ELECTROLYTES, CHEMICAL ANALYSIS DESCRIPTORS:

electrolyte carbonate—ion contamination on the capacity-voltage behavior of sintered plate nickel—cadmium aircraft batteries is described. An electrolyte analysis and a renewal procedure are liter of electrolyte with an electrolyte alkalinity presented and shown to be adquate and potentially useful at depot level. Specifications for the electrolyte of less than 26 grams of K2003 per of 7.45 + or - 0.05 normal, for maximum capacity output over imposed environmental and electrical An experimental investigation of the effect of conditions of an aircraft, are recommended. (Author)

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AD- 806 812

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

LIVINGSTON ELECTRONIC CORP MONTGOMERYVILLE PA AD- 805 711

EXPERIMENTAL AMMONIA BATTERY.

3

DESCRIPTIVE NOTE: Final rept. Aug 65-Jun 66, DEC 66 117P Sykes, Bernard; DEC 66 117P Sy CONTRACT: AF 30(642)-3906 PROJ: AF-5592 TASK: 559203

MONITO9: RADC TR-66-584

UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, \*AMMONIA), BATTERY CHARGERS, LOW TEMPERATURE BATTERIES, BATTERY SEPARATORS, PRIMARY BATTERIES, ELECTRIC DISCHARGES, ELECTROCHEMISTRY, VOLTAGE, COLD WEATHER TESTS, ELECTROLYTES, (U)ELECTROLYTES
IDENTIFIERS: AMMONIA BATTERIES, PROTOTYPE, SHELF

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milliamperes output, 36 hours life, 5 pounds over-all discharge times of 84 to 89 hours within 20 per cent shocks up to 175g along any axis. The results of this investigation produced experimental batteries weight, 55 cubic inches in volume, operating temperatures of minus 65 F to plus 125 F, 5 years shelf life, and capability to withstand mechanical This engineering investigation was performed to design and develop a 10 watt, 24/32 volt, low temperature primary reserve liquid amonia battery with minimum requirements for a prototype of 20 which met our minimum requirements and had end voltage regulation.

#### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

YARDNEY ELECTRIC CORP NEW YORK 13/8 AD- 802 279

3 DEVELOPMENT OF MANUFACTURING METHODS AND TECHNIQUES FOR THE PRODUCTION OF IMPROVED ALKALINE BATTERIES.

DESCRIPTIVE NOTE: Final technical rept. 1 Apr 65-30

Wagner, O. ; Enters, R. 176P 99 Jun 66,

CONTRACT: AF 33(615)-2578 PROJ: MMP-8-253 638-66 REPT. NO.

TR-66-236 MONITOR: AFML

UNCLASSIFIED REPORT

SEALS, OPTIMIZATION, NICKEL, CADMIUM, SILVER, ELECTRODES, OXIDES, ELECTRICAL PROPERTIES, SPECIFICATIONS, PERFORMANCE(ENGINEERING), HYDROXIDES, BATTERY SEPARATORS DESCRIPTORS: (\*ALKALINE BATTERIES, MANUFACTURING),

3

fabrication along with cell designs are presented. The + or - 1% matching in cell capacity was attained with five-cell sealed 14 ampere-hour nickel-cadmium batteries and five-cell sealed 15 ampere-hour silver-cadmium batteries on short orbit cycling regimes. For the silver-cadmium battery the + or capacity of 5.7 AH at -30 F, at the rates employed at the 75% depth of discharge, and a maximum A development program directed at the problem of producing improved sealed alkaline batteries with matched cell capacities + or - 1% of nominal amperenour rating is described. The required properties depth of discharge, and a maximum of 20.7 AH at 150 1% capacity was attained through 535 cycles on the short orbit regime up to 75% depth of discharge. Short orbit cycling data of sealed 15 AH - Ag/ The batteries deliver a minimum capacity of 11.5 of 14.8 AH at 75 F, at the rates employed at 25% of cell components are reviewed, and methods of F, at the rates employed at 25% deoth. The 14 AH - Ni/Cd battery cells deliver a minimum AH at -10 F, at the rates employed at the 75% Cd battery cells are presented and discussed.

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#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

- 786 635 10/3 17/7 ELECTRIC STORAGE BATTERY CO CLEVELAND OHIO AD- 786 635

3 3000 Ampere-Hour Charge-Retaining Battery for U.S. Coast Guard Buoy Service.

DESCRIPTIVE NOTE: Final summary rept. 28P REPT. NO. Test-956

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Primary batteries, Navigational lights, \*Buoys, Reliability(Electronics), Stability SUPPLEMENTARY NOTE:

3 that has been done over the past six years, beginning with the initial development stages and culminating in delivery of batteries to the Coast Guard for have been built. These batteries were designed and built to yield an uninterrupted, unattended two-year service cycle. This refort summarizes the work both laboratory testing and actual buoy service Nine Type CR-6-3000 charge-retaining batteries (Modified author abstract)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

- 785 970 10/3 8/9 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE AD- 785 970

Semiconducting Charge-Discharge Devices for Storage Batteries,

3

Volotkovskii, S. A. ; Fursov, V. D. ; Sidorenko, E. I. ; REPT. NO. FSTC-HT-23-1788-73 110

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Mekhanizatsiya i Avtomatizatsiya Proizvodstva (USSR) n2 p14-16 1973. DESCRIPTORS: \*Storage batteries, \*Semiconductor devices, \*Battery chargers, Mines(Excavations), Translations, USSR, Electric batteries, Control

3

IDENTIFIERS: \*Mining equipment, Coal mines

33

Discussed are storage battery semiconducting charge-discharge devices with three-phased bridge rectification for use on mine locomotives. Principle schematic given, plus schematic design for an automatic current stabilization circuit. Graph shows charge characteristics of typical storage batteries under tests in coal mines.

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT AD- 785 732

Lithium-Carbon Monofluoride Organic Electrolyte Manpack Battery.

3

Jun 72-Jun 74, AUG 74 44P Broglio, Edward P.; CONTRACT: DAABO7-72-C-0204 MONITOR: ECOM 72-0204-F DESCRIPTIVE NOTE: Final rept.

### UNCLASSIFIED REPORT

\*Electrodes, \*Graphite, Fluorides, Electrolytes, Reliability(Electronics), Fused salts \*Primary batteries, \*Lithium, SUPPLEMENTARY NOTE: DESCRIPTORS:

IDENTIFIERS: Lithium cells, Graphite fluorine clathrates, Design, Organic batteries, High

energy batteries

3 cover a high energy density primary lithium battery capable of good low temperature performance at high The purpose of this contract was to conduct research and development leading to the design and construction of a long-life, organic electrolyte battery for manpack equipment. The requirements power levels.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

CATALYST RESEARCH CORP BALTIMORE MD 10/3

Multishot Thermal Battery.

3

DESCRIPTIVE NOTE: Final rept., Schneider, Alan A. ; Long,

Stephen E. : Bowser.George C. : CONTRACT: DAAD05-73-C-0555 PROJ: LWL-02-E-73

### UNCLASSIFIED REPORT

CR-02E73

MONITOR: LWL

SUPPLEMENTARY NOTE:

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DESCRIPTORS: \*Thermal batteries, \*Radio equipment, Electrolity(Electronics), Anodes, Cathodes, Electrolytes, Calcium, Magnesium, Potassium compounds, Chlorides, Lithium chloride, Calcium compounds, Chromates
IDENTIFIERS: Performance evaluation, Trioxanes, Calcium chromates, AN/PRC-77

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that both the Mg anode and FeS2 cathode would also prove acceptable. Test regimens are described and test results detailed showing that the battery will meet electrical specifications when subjected to environmental preconditionings such as heat, cold, working prototype which was capable of four cycles to the final version which is capable of at least five wind, vibration and dropping. A brief description of some of the tests which led to the choice of cell cathode (depolarizer). The choice was based primarily on electrical performance and secondarily A summary of the development of a multishot thermal chemistry is included. A chronological description battery is presented. The battery is designed to power the AN/PRC-77 radio for at least four terminute cycles. The cell of choice used a Ca on prior experience with the system. Tests show of design improvements is given, from the first anode, LiCI-KCl electrolyte and a CaCrO4

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PAGE

AD- 785 584

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reliable cycles. (Modified author abstract)

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE AD- 784 757

3 A Perforator of Lamellar Tapes for Alkaline Storage Battery Electrodes,

Takarev, A. F. ; Vdovin, Yu. V. ; Gavryushov, A. N. ; REPT. NO. FSTC-HT-23-0343-74 ທີ

### UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Trans. of Patent (USSR) 350 075, DESCRIPTORS: \*Storage batteries, \*Electrodes, Battery components, Tapes, Perforation, Translations, USSR, Patents

3 as alkaline battery electrodes is described. The device eliminates the loss of material from the tape in the punching process. This is accomplished by a roller punch and die configuration in which the die inset diameter is a touth diameter larger than the A mechanism for perforating the lamellar tapes used diameter of the punch tooth.

#### UNCLASSIFIED

SEARCH CONTROL NO. 20MO7 DDC REPORT BIBLIOGRAPHY

783 832 10/2 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE AD- 783 832

Electrotechnical Handbook (Extract),

3

REPT. NO. FSTC-HT-23-76-74

### UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Trans. of mono. Elektrotekhnicheskii Spravochnik, Moscow, 1971 v1 bk2 4ed rev., p752-767, 811-832, by Peabody.

DESCRIPTORS: \*Electric power plants. \*Electric batteries, Mobile, Handbooks, Primary batteries.
Storage batteries, Translations, USSR

3 The report covers mobile power stations and electric batteries.

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200	REPORT	8181	DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT	SEA	RCH	CONTR	10	ó	ZOMOZ	DDC
AD- 78	3 490 ELECTR	ONICS	AP- 783 490 10/2 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J	FORT	MONN	DUTH 1	7			AD- 783 EAGLE
Seal	ed Zinc	-0×vo	Sealed Zinc-Oxygen Cells.						(a)	Lead

DESCRIPTIVE NOTE: Technical rept.,
AUG 74 12P Wagner,Otto C.; NO. ECCM-74-4235 DA-1-S-762705-AH-94 1-S-762705-AH-94-P-2 REPT. N PROJ: TASK:

### UNCLASSIFIED REPORT

	3	3
*Anodes,		
*Zinc,		
batteries,	ectronics)	en cells
*Storage	ability(El	Zinc oxyg
DESCRIPTORS:	Oxygen, Reliability(Electronics)	IDENTIFIERS: Zinc oxygen cells

zincroxygen system. Little success was attained by these approaches. Several basic approaches are suggested for resolving the zinc shape change problem Sealed zinc-oxygen cells attained 100 cycles with a 15-25% reduction in capacity. Several basic approaches were taken to reduce the rate of zinc shape change, which is the major failure mode of the in future zinc-oxygen cell designs. (Author)

### UNCLASSIFIED

DEPT
COUPLES
S S
JOPLIN
INC
10/3 INDUSTRIES
AD- 782 910 10/3 EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT

1-Acid Reserve Battery.

3

DESCRIPTIVE NOTE: Final rept.,
APR 74 38P Erisman, L. R.
CONTRACT: DAAA21-72-C-0540

### UNCLASSIFIED REPORT

Lead
of a
The report discusses the development of a Lead
the d
discusses
report
The

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Acid Reserve Battery identified as Eagle-Picher Battery number GAP-1500. The overall program was divided into two major parts, Battery Electrochemical Design (Part I) and Activation Mechanism Design Incorporation (Part II). The final battery configuration, is Shown.

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AD- 782 910

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#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

STANFORD UNIV CALIF CENTER FOR MATERIALS RESEARCH

Solid Electrolyte Battery Materials.

3

Huggins, Robert A. DESCRIPTIVE NOTE: Technical rept., MAR 74 221P Huggins, Rol REPT. NO. CMR-74-8, TR-2 CONTRACT: N00014-67-A-0112-0075 PROJ: NR-056-555

### UNCLASSIFIED REPORT

compounds, Alumina, Graphite, Ions, Ionic current, Electric conductors, Cathodes, Oxides, Iron compounds, Cyanides, Transport properties, Alkaline earth compounds, Fluorides, ESCRIPTORS: \*Storage batteries, \*Battery components, \*Solid electrolytes, Alkali metal DESCRIPTORS:

3 DENTIFIERS: Ferrate/hexacyano, Intercalary compounds

3

their structures analyzed, and ionic mobility studies intercalation compounds for use as potential cathode The program consists of two major parts at the present time: Investigation of the synthesis and fabrication of oride solid electrolytes, and search for new alkali metal ion-conducting solid electrolytes. An investigation of the structure and transport behavior of species within graphite systems is also being pursued. The technique being investigated for the fabrication of oxides is based upon the controlled oxidation of infiltrated number of ferrocyanide compounds have been prepared polymeric precursor materials. In this method a measurements have been carried out on undoped, suitable polymer material is infiltrated with metallic salts and subsequently decomposed. A performed on them. Ac and dc conductivity Zrf4 doped, and Baf2/Alf3 doped polycrystalline KAlf4. (Modified author

#### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

DOW CHEMICAL U S A WALNUT CREEK CALIF 10/3

Research and Development on the Glass Fiber Sodium-Sulfur Battery.

3

DESCRIPTIVE NOTE: Semi-Annual technical rept., Levine, Charles A. ; CONTRACT: DAHC15-73-C-0254, ARPA Order-2381 36P

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Storage batteries, Fiberglass,

Fabrication, Thermal cycling tests IDENTIFIERS: \*High energy batteries, \*Sodium sulfur cells, Performance evaluation, Design

3

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3 of fine hollow glass fibers as the electrolyte-separator. Use of thousands of these hollow glass fibers, bundled together in parallel and filled with sodium as the anolyte, result in a cell that has a very high energy per unit weight at a high power per unit weight. The authors are trying to make multisodium-sulfur secondary battery which uses the walls long lifetimes, to scale up to a 5 ampere-hour cell, to continue development of a 40 ampere-hour cell, to determine operating parameters at different chargecharge-discharge, to build larger cells capable of Development is proceeding on a high energy density fiber cells capable of at least 1000 cycles of discharge rates, and to determine construction details necessary for thermal cycling.

- 781 983 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

3 Chemical Charging of Nonlamellar Cadmium Electrode of an Alkaline Battery,

Romanov, V. , Zimina, K. S. ; Sandler, P. I. ; REPT. NO. FSTC-HT-23-135-74

### UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Alkaline batteries, \*Nickel cadmium batteries, Patents, Hydrazine, Translations, SUPPLEMENTARY NOTE: Trans. of Patent (USSR) 336

3 DENTIFIERS: Charging, Nickel chlorides, \*Battery electrodes

3 cadmium electrode of an alkaline battery can be made more efficient if the electrode is soaked in a solution of nickel chloride before processing in the reducing solution, and if hydrazine is used as the reducing agent. Using this method, the nominal capacity of the electrode can be obtained on the The chemical method of charging the nonlamellar first discharge.

#### UNCLASSIFIED

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

Evaluation Program for Secondary Spacecraft ENGINEERING LAB

DESCRIPTIVE NOTE: Annual rept. no. 10, FEB 74 257P Christy,D. E. ;Harkness,J. Ce11s.

3

REPT. NO. QEEL/C-74-34

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Report on Cycle Life Test.
See also AD-762 602.
DESCRIPTORS: \*Nickel cadmium batteries, \*Silver zinc batteries, \*Spacecraft components, Test methods, Life tests, Temperature, Reliability(Electronics)

3

development efforts toward improving the reliability of space batteries. Battery weaknesses encountered in satellite programs such as IMP, NIMBUS, OGO, Spacecraft power systems planners, designers, and integration teams. Weaknesses discovered in ceil Characteristics and limitations which is used by through special tests performed at NAD Crane. UAD, and TETR have been studied and remedied design are reported and aid in research and The evaluation program gathers statistical information concerning cell performance

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AD- 781 835

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

1- 781 788 10/3 22/2
NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB AD- 781 788

Nickel-Cadmium Spacecraft Cells with Auxiliary Electrodes for the Small Astronomy Satellite (SAS-C). Evaluation Program for Secondary Spacecraft General Electric Company 8.0 Ampere-Hour cells: Initial Evaluation Tests of

Harkness, d. D. ; REPT. NO. QEEL/C-74-252 19F

### UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Nickel cadmium batteries, \*Storage batteries, \*Spacecraft components, Test methods. Reliability(Electronics), Life tests

The purpose of this eviluation test program is to insure that all cells put into the life cycle program are of high quality by the screening of cells found to have electrolyte leakage, internal shorts, test. Test limits specify those values in which a cell is aerospace nickel-cadmium cells with demonstrated life discharge. Requirements are referred to as normally to be terminated from a particular charge or expected values based on past performance of characteristics.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

)- 781 261 18/14 10/2 NAVAL NUCLEAR POWER UNIT FORT BELVOIR VA AD- 781 261

Operating Report for Radioisotopic Power Generators of the U.S. Navy. Volume 7. Number 2.

3

DESCRIPTIVE NOTE: Rept. for 1 Apr-31 Dec 73. 85P

### UNCLASSIFIED REPORT

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3 \*Radioisotope batteries, \*Radioactive isotopes, \*Electric generators, \*Radioisotope thermoelectric devices, Naval equipment, Reviews IDENTIFIERS: SNAP 23A isotopic generators, DESCRIPTORS:

Radioisotope heat sources

3

containe: in this report are presented as an impartial collection of facts, observations and other information. The East Coast RPG Surveillance Facility (SURFAC) located at the Naval Nuclear Power Unit, Fort Belvoir, was placed operational on 1 June 1973. Three vehicle for the accumulation and dissemination of information concerning the application and operation of radioisotopic power generators (RPGs) within the Navy. It will be noted that all RPGs presently listed are radioisotope thermoelectric generators (RTGs). Unless specifically identified as an engineering evaluation, items The objective of the report is to serve as a Sentinel 25-D's were placed operational on a

Laboratory of the coast of Panama City, Florida. Three Sentinel 25-E's were recovered from the Amchitka Island, Alaska area The AEC turned over the development SNAP-23A to the U.S. Navy. Eight Gulf one-watt RPG's were procured by the U.S. Navy. and turned over to the U.S. Navy by the AEC. (Author)

tower operated by the Naval Coastal Systems

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AD- 781 788

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE 10/3 AD- 781 250

An Automatic Storage Battery Charger

3

Zorokhovich, A. E. Zilitinkevich, A. Ya. ; Eygel, F. I. ; REPT. NO. FSTC-HT-23-0119-74 6P

### UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Battery chargers, Storage batteries, Automatic, Patents, Translations, USSR SUPPLEMENTARY NOTE: Trans. of Patent (USSR) 354

Storage battery from a three phase AC line. The device employs silicon controlled recitfiers which are controlled by voltage regulated triggers incorporating feedback from a shunt resistor in the control. The design also uses an adder between the current sensing shunt and the thyristor control battery charging circuit for charging current assembly; increaded reliability and smoother regulation are obtained.

#### UNCLASSIFIED

ZOWOZ SEARCH CONTROL NO. UDC REPORT BIBLIOGRAPHY

AD- 781 224 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE 3 Study of Operating Modes of Diesel Locomotive Alkaline Storage Batteries (Povyshenie Effektivnosti Elektricheskoi Peredachi Teplovozov),

Koshevoi, V. REPT. NO. FSTC-HT-23-1858-73

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Vsesoyuzny: Nauchno-DESCRIPTORS: \*Alkaline batteries, \*Diesel engines, Transporta. Trudy (USSR) n429 p131-142 1971, by issledovatelskii Institut Zheleznodorozhnogo Performance (Engineering), Storage batteries, Translations, USSR IDENTIFIERS: Iron nickel cells Albert L. Peabody.

33

occurring during operation of iron-nickel batteries. capacity of batteries in the starter discharge mode negative electrode. The battery charging voltage of 75.v (1.63 v/element) currently used causes In the range of above-zero temperatures (C), the extreme overchanging of batteries and excessive heating. This significantly reduces the service life of batteries and decreases their operating is limited by the positive electrode, not the The paper discusses an analysis of processes reliability.

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AD- 781 224

PAGE

ZOW0Z SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

POWER CONVERSION INC MOUNT VERNON NY

Primary Organic Electrolyte Battery Ba-584

3

DESCRIPTIVE NOTE: Final rept. Jul 72-Dec 73,

Abens, Sandors; MAR 74 54) Abe

PROJ: DA-1-G-763702-DG10 TASK: 1-G-763702-DG-1001

ECOM 0287-F-72 MONITON:

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Nonaqueous electrolytes, Lithium, Performance(Engineering), Test methods, Primary batteries, Life expectancy

IDENTIFIERS: \*Lithium cells

33

on this program, 48 units were subjected to environmental and service life tests. With a cyclic load averaging to about 130 mA, service life was over 120 hours at room temperature. Reduction in service life was about 10% at 125F, 30% at -20F and 50% af -40F. About 95% of initial service life was retained after 30 days of stand at Lithium-organic electrolyte batteries equal in size and output voltage to the BA-4386 magnesium battery were built and tested. Of the 307 batteries built 160F. (Modified author abstract)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

TYCO LABS INC WALTHAM MASS

Lithium-Nickel Sulfide Batteries.

3

DESCRIPTIVE NOTE: Final rept. 15 May 73-14 Nov 73, FEB 74 25P Vaidyanathan, Hari ; Malachesky,

Paul :Holleck,Gerhard : CONTRACT: F19628-73-C-0271 PROJ: AF-8659 TASK: 865904

TR-74-0081 MONITOR: AFCRL

### UNCLASSIFIED REPORT

Flectric batteries, Viscosity, Electrical conductivity, Electrodes, Nonaqueous electrolytes, Crystal structure, Discharge, Rates, Primary \*Cathodes(Electrolytic cell), DESCRIPTORS:

IDENTIFIERS: \*Lithium nickel sulfide cells batteries

33

such positive electrode structures can be discharged cells specifically designed for high rate usage such avoid rehydration/dissolution of the nickel suifate which apparently limits the attainable loadings. Electrochemical evaluation of Ni3S2-impregnated Studies have been carried out on the development of plaque structures in simple Li cells has shown that Ni352-impregnated plaque electrode structures for use as positive plates of high discharge rate capability in nonaqueous electrolyte lithium batteries. Achievement of reasonable Ni352 loadings in nickel plaques requires conversion of NiSO4 to Ni3S2 before each impregnation to at rates up to the C-rate with utilization > or = electrode structures may be advantageous. 60%, using mixed THF-PC electrolytes. In

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(Modified author abstract)

AD- 779 691

145

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

NAVAL ORDNANCE LAB WHITE OAK MD 10/3

3 Theoretical Simulation of the Performance of Molten Salt Thermal Batteries.

DESCRIPTIVE NOTE: Technical rept. Jun 71-Jun 73, Kushner, Alan S.; AUG 73 29P Kushner REPT. NO. NOLTR-74-24 PROJ: ORD-333-301/UF00-383-301 29P AUG 73

UNCLASSIFIED REPORT

DESCRIPTORS: \*Thermal batteries, \*Electrolytes, \*Fused salts, Lithium chloride, Heat transfer, Electrochemistry IDENTIFIERS: Design, Computer aided analysis,

3 3

Lithium batteries, High energy batteries

3 variation within the cell during start-up and during current within the cell are all included. The program calculates the spatial and time temperature electrolyte zone for cell operation, and calculates electrochemical phenomena, and the flow of electric solves the coupled set of equations describing the temperature distribution within a molten salt cell cell operation, checks for a satisfactory molten and the electrical characteristics of the cell. the cell voltage-current characteristics as a function of time. TEAB has been utilized in the been developed as a tool for the computer-aided design of molten salt thermal batteries. TEAB Heat generation due to start-up heat source, A computer program for the Thermal and Electrical Analysis of 3atteries (TEAB) has Naval Ordnance Laboratory. (Modified author Li-C12 Battery Development Program at the

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMD7 DDC REPORT BIBLIOGRAPHY

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO 10/1 10/3

New Electrochemical Sources of Energy

3

REPT. NO. FID-HT-23-0012-74 PROJ: FID-T74-04-03

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Edited trans. of Vsesoyuznoe Knimicheskoe Obshchestvo. Zhurnal (USSR) v16 n6 p685-690 1971, by Charles T. Ostertag, Jr. DESCRIPTORS: \*Electric batteries, \*Fuel cells, Reviews, Alkaline batteries, Storage batteries,

Catalysts, USSR, Translations IDENTIFIERS: \*Electrochemical cells, Electrochemical power generation

3 3

> including galvanic cells, storage batteries, and fuel The translation briefly reviews the history and state of the art of electrochemical current sources,

> > UNCLASSIFIED

AD- 779 269

AD- 779 175

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parameters. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

J- 778 825 10/3 7/4 17/4 LOCKHEED MISSILES AND SPACE CO INC PALO ALTO CALIF PALO ALTO RESEARCH LAB AD- 778 825

Electronic Countermeasure Devices. Advance Lithium-Water Battery for

3

DESCRIPTIVE NOTE: Rept. for 1 Nov 72-1 Nov 73 Bauman, Hubert F. ;

3 57P LMSC-D356295 REPT. NO.

TR-73-120 F33615-73-C-2021 CONTRACT: MONITOR:

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Electrochemistry, Temperature, Electrolytes, Fuel cells, Water, Alkaline batteries, Lithium, Storage batteries, Electric current, Efficiency, Electrical conductivity, Polarization, Cathodes(Electrolytic cell),

3

3 Catalysis, Additives
IDENT FIERS: \*Lithium wather fuel cells,
Performance evaluation, Lithium hydroxide

3 present study and marked improvements made in lithium utilization efficiency by the selection of electrolyte and in the cell potential by the use of catalyzed cathodes. Cell studies show that a spaced electrode cell can be operated with lithium hydroxide concentrations of 2.5- to 3.5-M in the electrolyte at 10 to 30c at current densities to cathodes have reduced polarization and their use will increase by 10 to 25% the power capability of the lithium-utilization efficiency at potentials of over expected with optimized cell construction. Selected electrolytes may be used that allow 50 to 80% 1.5A/sq. in. About double this power density is 1 V at temperatures to 30 degrees C. Catalyzed system. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

)- 778 786 7/4 10/3 ESB INC YARDLEY PA ESB TECHNOLOGY CENTER AD- 778 786

Magnesium Film Study.

3

DESCRIPTIVE NOTE: Rept. no. 2 (Final), 15 Nov 72-15 Dafler, James R. ; Hull, Michael ... ; Doe, James B. ; Venuto, C. Joseph MAR 74 135P Jul 73.

CONTRACT: DAAB07-72-C-0184 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302

ECOM 0184-F-72 MONITOR:

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also report dated Jul 73, AD-

DESCRIPTORS: \*Dry batteries, \*Anodic coatings, \*Magnesium, Anodes(Electrolytic cell),

Corrosion, Films, Electron microscopy, X rays, Fluorescence, Surface chemistry, Electrolytes, ray diffraction, Chemical composition, Crystal IDENTIFIERS: Atomic absorption spectroscopy, X ray fluorescence, X ray analysis

3 3

formed on the magnesium dry cell anode by inhibitors, prior to and during storage, have been examined for action and the unproductive corrosion encountered in The structure and composition of the various films the purpose of eliminating or reducing the delayed (TEM). Special emphasis is placed upon correlation of test data with applicable dry cell spectroscopy and transmission electron microscopy electron microscopy (SEM), energy dispersive Xthe magnesium dry cell. Various techniques to evaluate these films, and associated dry cell constituents have been developed for scanning ray fluorescence (EDX), atomic absorption

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) AD- 778 779

3 Lead Chloride Cathodes tor Water-Activated Batteries,

Coleman, J. R. 73 17P

### UNCLASSIFIED REPORT

International Symposium on Power Sources, v4 p33-49 Availability: Pub. in Proceedings of

\*Cathodes(Electrolytic cell), Sonobuoys,
Performance(Engineering), Fabrication, Hot
pressing, Lead compounds, Chlorides, Canada
IDENTIFIERS: \*Lead chlorides DESCRIPTORS: \*Water activated batteries,

33

3 of single cells and multicell batteries is described, chloride, lead powcer and graphite, typically in the proportions 70:30:3 by weight, on a conductive metal grid. The lead flows under the influence of heat and pressure and bonds the cathode together. chloride cathodes by hot pressing a mixture of lead Methods are described for the preparation of lead sheet magnesium alloy as anodes. The performance These cathodes were assembled into cells, using discharged under various conditions, employing synthetic sea-water and LiCl electrolyte. These batteries appear suited to sonobuoy applications. (Modified author abstract)

#### UNCLASSIFIED

ZOWOZ DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND 22/2 10/3 ENGINEERING LAB AD- 778 671

Evaluation Program for Secondary Spacecraft Cells Initial Evaluation Tests of Eagle-Picher Industries, Incorporated 20.0 Ampere-Hour Nickel-Cadmium Spacecraft Cells,

3

Harkness, J. D. ; REPT. NO. QEEL/C-74-228

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, spacecraft components, Performance(Engineering), Test

3

The report describes testing of 18 20.0 amp-hr nickel cadmium spacecraft cells manufactured by Eagle-Picher Industries, Inc. Test Procedures, results, and recommendations are included.

3

AD- 778 671

PAGE

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

ARMY LAND WARFARE LAB ABERDEEN PROVING GROUND MD AD- 778 198

Emergency Arctic Battery.

3

Paxton, Curtis L. DESCRIPTIVE NOTE: Final rept.,
MAR 74 27P Paxton
REPT. NO. LWL-TR-74-56
PROJ: LWL-01-E-72

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Thermal batteries, \*Low temperature batteries, Test methods, Radio equipment, Performance(Engineering), Cold weather, Pyrotechnics, Primers, Emergencies

3

3 The report describes the development and testing of thermal type battery systems for the AN/PRC-77 and AN/PRC-74 radio sets. They were designed as emergency power sources for the radio systems when operating under adverse arctic weather conditions at temperatures as low as -65F where standard radio batteries are inadequate. Test results indicate that the batteries meet or exceed all important performance requirements under arctic weather conditions in Alaska. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

- 777 665 10/3 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO AD- 777 665

Possibilities for Increasing the Technical Level and Specific Weight and Volumetric Electrical Rating Characteristics of Chemical Sources of Current,

3

Ogromnov.P. V. ;Savelchikov, L. P. : REPI. NO. FID-MI-24-400-74 PROJ: FID-174-03-04 15P MAR 74

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Edited machine trans. of Vsesoyuznyi Nauchno-Issledovatelskii Akkumuliatornyi Institut. Sbornik Rabot po Khimicheskim Istochnikam Toka (USSR) n4 p3-10 1969, by Charles I. Ostertag, DESCRIPTORS: \*Storage batteries, Lead acid batteries, Nickel cadmium batteries, Silver zinc batteries, Production, Iron, Translations,

3 The authors consider the contemporary state of the production of chemical current sources at battery plants and the ways of improving the future design and technology of storage batteries.

3

AD- 778 198

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 776 175 10/3
ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE
VA

Ceramic Thermal Junction Used in Thermoelectric Devices,

 $\widehat{\Xi}$ 

NOV 73 11P Zvyagina, E. REPT. NO. FSTC-HT-23-1084-72

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### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Kholodilnaya Tekhnika i Tekhnologiya (USSR) n9 p17-23 1970.
DESCRIPTORS: \*Thermoelectricity, \*Junctions, \*Thermal batteries, Ceramic materials, Thermal conductivity, Dielectric properties, Metallizing, Beryllium oxides, Translations, USSR

The paper considers the problem of developing effective thermal junctions which would differ favorable from those in current use by having minimal temperature drops and would not be inferior with respect to their electrical, mechanical and other properties. The greatest shortening of the thermal junctions currently used for thermoelectric batteries is the existence of significant temperature drops. (U)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 774 B11 10/3 1/3 EAGLE-PICHER INDUSTRIES INC COLORADO SPRINGS COLO PRÉCISION PRODUCTS DEPT

Nickel-Cadmium Monoblock Battery BB-433(x-1)/A.

3

DESCRIPTIVE NOTE: Final rept. Apr 71-Feb 74, FEB '4 37P Hill, James M.; McCarter, Walter K.; CONTRACT: DAAB07-69-C-0269

### UNCLASSIFIED REPORT

PROJ: DA-23-L0-10221643-HBZZ MONITOR: ECOM 0269-F-71 DESCRIPTORS: \*Nickel cadmium batteries, \*Aircraft equipment, Performance(Engineering)
IDENTIFIERS: Design

33

Strong, high-temperature ceramics are defined as those materials that can withstand thermal cycling without failure which is necessary for their use in high temperature structural applications. Tor this reason, hot-pressed Si3N4 and SiC are emphasized. The relations between fabrication barameters, microstructure and strength are presented for both materials. Other structural considerations, viz., resistance to thermal shock and coxidation are reviewed. Finally, current directions for obtaining improved and new materials dre discussed. (Author)

PAGE

UNCLASSIFIED

AD- 774 811

ZOMOZ DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

- 774 797 10/3 1/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 774 797

Performance of Battery Lu-641/A in OH-6A Helicopter. DESCRIPTIVE NOTE: Research and development technical rept.,

Duze, Sylvia ; PROJ: DA-1-5-762705-AG-94 20P 74

TASK: 1-5-762705-4G-94-P-2

### UNCLASSIFIED REPORT

Aircraft equipment. Instrumentation, Monitors, Temperature, Voltage, Electric current, Tape recorders, Oscilloscopes
(DENTIFIERS: Performance evaluation DESCRIPTORS: \*Nickel cadmium batteries, \*Helicopters, Performance(Engineering)

33

tape recorder so that any portion of the flight could be replayed in the laboratory. A portable oscilloscope was connected to the output terminals of simultaneously monitor the voltage, current, and temperature of a battery during start and flight of an aircraft. Data were collected continuously on a the tape recorder to check its operation during V. 13 Ah nickel-cadmium battery used in the OH-6A Helicopter, was selected for this investigation. After flight information was flight of the aircraft. Battery BB-641/A, a 24 Instrumentation was devised at ECOM to

the battery under its assigned conditions of location and performance in the aircraft, and various battery information can be use to determine the adequacy of collected on the tape recorder, it was played back into a memory oscilloscope in the Laboratory and record of the data was obtained by replaying the designs in the aircraft can be more positively photographed. In addition, continuous written significant portions of the information were tapes back on a recording voltmeter. This evaluated. (Modified author abstract)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

- 774 674 10/3 13/10 ENERGY RESEARCH CORP BETHEL CONN AD- 774 674

Evaluation of Improved Separator Material in Large Silver-Zinc Cells for Use in Submersible Vehicles.

3

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DESCRIPTIVE NOTE: Final rept. 1 Aug 72-31 Jan 74, Charkey, Allen ; CONTRACT: N00024-73-C-5044 110 CAN

### UNCLASSIFIED REPORT

separators, Performance (Engineering), Underwater \*Silver zinc batteries, \*Battery DESCRIPTORS:

Performance evaluation IDENTIFIERS: vehicles

33

Sterilizable silver-zinc cells. The original six rejection of separator materials and delays in The purpose of this program was to fabricate prototype silver-zinc cells of NR-1 (850Ah) and Dolphin (4000Ah) sizes containing inorganic separators. These separators had month program extended over 18 months due to previously been developed for use in heatreceiving improved separators.

3

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PAGE

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 774 562 10,3 22/2
AEROSPACE CORP EL SEGUNDO CALIF LAB OPERATIONS

Penetration of Cacaium into Nylon Separators of Ni-Cd Batteries.

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David:

REPT. NO. TR-0074(4270-10)-3

CONTRACT: F04701-73-C-0074

MONITOR: SAMSO, GIDEP TR-74-17,102.00.75.00-8A-01

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, \*Battery separators, \*Spacecraft components, Electric batteries, Failure. Cadmium, Discoloration, Nylon, Electron microscopy

3

Because of the preflight occurrence of failure resulting from a short circuit between plates and extensive cadmium migration to the separators of a satellite, a series of photomicrographic prostigations has been made of the depth of cadmium penetration into a separator from the cell and related cells. Electron probe and ion probe studies were also conducted. It was found that cadmium penetrations as deep as 80% occurred, and, in many instances, a depth of more than 30% of separator penetration was observed. Since cell failure and battery performance losses can be caused by 100% penetration depths of cadmium, the results of the investigation indicate that cadmium migration and penetration indicate that cadmium migration and penetration fire the separators of this set of Ni-CC cells constitute a serious problem with respect to meeting the power-storage lifetime requirements of the electrical system for the satellite. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 774 308 10/3 TRW SYSTEMS GROUP REDGNDD BEACH CALIF Investigation of High Temperature Battery Systems.

3

DESCRIPTIVE NOTE: Final technical rept., 1 Jul 72-31 Oct 73,
JAN 74 47P Seo,E. T.; Sayano,R. R.; Carroll,D. F.; MClanahan,M. L.; Silverman,

H. P.; REPT. NO. TRW-23323-6015-RU-00 CONTRACT: DAAB07-72-C-0312 PROJ: PROJ-C8-2-04136-01-C8-CA MONITOR: ECOM 0312-F

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Sodium, \*Sulfur, \*Electric batteries, Performance(Engineering), Seals, Battery components, High temperature, Fabrication, Solid electrolytes, Alumina IDENTIFIERS: Performance evaluation, Design

33

The main objective of this program was the construction and testing of sodium-sulfur cells which would be hermetically sealed and operable at 300C. Intermediate objectives included the evaluation of all proposed materials, seals and construction techniques as to their suitability for the sodium-sulfur system. New sealing methods for making ceramic to methor abstract) (Modified (U)

ZOWOZ DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

TYCO LABS INC WALTHAM MASS

Low Temperature Electrochemical Systems.

3

DESCRIPTIVE NOTE: Final rept., ner 73 156P Malachesky, Paul A.; Cahill, Kathleen ; DNTRACT: DAABG7-71-C-0291 ROJ: PRON-C8-1-04407-01-68-CA DNITOR: ECOM 0291-F CONTRACT:

PROJ:

MONITOR:

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also report dated Aug 72, AD-DESCRIPTORS: \*Low temperature batteries, \*Metal air batteries, \*Cathodes(Electrolytic cell), Oxygen, Transport properties, Electrochemistry, Electrodes, Air, Platinum,

Performance (Engineering), Reaction Kinetics, Microstructure, Porosity Catalysts, Surface properties, Electrolytes, Cesium compounds, Hydroxides, Mass transfer, Heat of activation, Structures, Tetrafluoroethylene resins

IDENTIFIERS: \*Zinc air cells, Tafel lines

33

3 temperature behavior of air electrodes for metal-air battery systems, specifically zinc-air cells. The studied influences on cathode performance include (via electrolyte variations and electrode structure kinetics (via measurement of exchange currents, reduction) and mass electrode transport factors Tafel parameters, heats of activation for 02 The report describes research on the low effects). An improved zinc-air cell

#### UNCLASSIFIED

ZOM07 DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

ENERGY RESEARCH CORP BETHEL CONN AD- 772 944

High Energy Sealed Nickel-Zinc Batteries.

3

DESCRIPTIVE NOTE: Final annual rept. 1 Mar 72-1 Oct Charkey, Allen ; 46P NON

DAAB07-72-C-0114 PROJ: 1-T-752705-A-053 MONITOR: ECOM 0114-F-72 CONTRACT:

### UNCLASSIFIED REPORT

DESCRIPTORS: \*Storage batteries, High energy, Zinc, Nickel, Reliability(Electronics)
IDENTIFIERS: \*Nickel Zinc cells

33

oxygen recombination electrodes the battery is capable of continuous overcharge at 0.5 amperes at a safe steady state pressure below 50 psi. Improved inorganic separators (ERC-2002) have been developed which are chemically inert in KDH, have a uniform pone size distribution and stop the occurrance of zinc dendrites. The primary cause of failure of the battery was found to be from the zinc A sealed 7 Ah/6.5 volt nickel-zinc battery has been developed which is capable of 160-200 cycles of operation at approximately 60% depth of discharge at the C/4 rate. Initial energy density obtained was 28 Wh/lb at the C/4 discharge rate. The battery will deliver about 40% of its energy at 20F at the C/4 rate. With silver amalgam electrode failure. (Modified author abstract)

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PAGE

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 772 903

Zinc-Air (Oxygen) Cell Studies.

3

Wagner, Otto C. DESCRIPTIVE NOTE: Technical rept., 20P

DA-1-T-762705-A-053 ECOM-4166

1-T-762705-A-05302 TASK:

### UNCLASSIFIED REPORT

separators, Storage batteries, Nickel, Epoxy resins, Sealed systems, Potassium compounds, \*Electric batteries, \*Battery DESCRIPTORS:

 $\Xi$ 3 IDENTIFIERS: \*Zinc air cells, \*Zinc oxygen cells, Potassium titanates

layers was prevented in zinc-air and zinc-oxygen cells by inserting a 10 mil thick partially wetproofed porous nickel layer within the layers of separator material. Excellent capacity maintenance was attained for 50 cycles from a zinc-air cell by: Shorting by zinc penetration through the separator

a thin plastic shield, and (c) providing a 20 to 30 mil thick electrolyte channel between the charging electrodes and separator clad anode. Preliminary results from sealed zinc-oxygen cell investigations edge of the electrolyte face and a thin porous teflon layer is cemented to the gas face, (b) using silver-amalgam catalyzad oxygen electrodes, and (c) adding 5% potassiu. titanate powder to the zinc oxide mix. (Author) attained by: (a) sealing the charging electrode within a plastic frame onto which a layer of potassium titanate paper is epoxy-sealed to the frame onto which the separator layers were epoxy-sealed, (b) blocking the edges of the anode with containing the zinc anode within a plastic Indicate that good capacity maintenance can be

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

AD- 771 993 10/3 22/2
NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB

Evaluation Program for Secondary Spacecraft Cells. Initial Evaluation Tests of General Electric Company 6.0 Ampere-Hour Nickel-Cadmium Spacecraft Cells with Auxiliary Electrodes for the Atmospheric Explorer Satellite C and D,

3

Harkness, J. D. ; REPT. NO. QEEL/C-74-1

### UNCLASSIFIED REPORT

3 DESCRIPTORS: \*Spacecraft components, \*Nickel cadmium batteries, Performance(Engineering), Satellites, Tables(Data), Leakage, Storage batteries

3 The purpose of this evaluation test program is to insure that all cells put into the life cycle program are of high quality by the screening of cells found to have electrolyte leakage, internal shorts, low capacity, or inability of any cell to recover its open-circuit voltage above 1.150 volts during the internal short test.

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

ENERGY RESEARCH CORP BETHEL CONN

Secondary Zinc-Oxygen Batteries.

3

DESCRIPTIVE NOTE: Final rept. Jun 72-Jun 73, NDV 73 46P Klein,Martin ; CONTRACT: DAABO7-72-C-0272 ECOM 0272-F-72 CONTRACT:

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also report dated Mar 72, AD-

Zinc, Oxygen, Electrodes, Battery separators, Battery compartments, Incrganic materials, Test methods, Performance(Engineering)
[DENTIFIERS: Oxygen electrodes, Zinc air cells, Gold nickel, Design \*Storage batteries, Fabrication, DESCRIPTORS:

3 3

includes investigations and screening of inorganic separator materials, optimization of the rechargeable leading to the construction of a long life high energy density sealed zinc-oxygen secondary battery which is capable of operating over the range of temperatures and rates compatible with Army rechargeable oxygen electrode schemes, including bifunctional and monofunctional electrodes, and design, fabrication and testing of a lightweight communications and surveillance equipment. It The report describes research and development zinc electrodes, investigation of various

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sealed 6 volt, 25 ampere-hour zinc-oxygen battery.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

)- 771 861 10/3 22/2 NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB

Evaluation Program for Secondary Spacecraft Cells. Initial Evaluation Tests of Gulton Industries, Incorporated 20.0 Ampere-Hour Nickel-Cadmium Spacecraft Cells with Auxiliary Electrodes,

3

Harkness, J. D. QEEL/C-74-2 NASA-Order-23404-G 23P REPT. NO.

UNCLASSIFIED REPORT

DESCRIPTORS: \*Nickel cadmium batteries, Storage batteries, Spacecraft components, Test methods, Performance(Engineering), Tables(Data)
IDENTIFIERS: Performance evaluation

33

3 The report describes testing and evaluation of 20.0 ampere-hour Ni-Cd spacecraft batteries.

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT	10/3 22/2 NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB
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DDC R	NAVAL ENGINE

Evaluation Program for Secondary Spacecraft Cells. Initial Evaluation Tests of 20.0 Ampere-Hour Nickel-Cadmium Spacecraft Cells Manufactured by Gulton Industries,

Harkness, J. D. 73 22P narnus QEEL/C 73-459 NASA Grder-S-23404-G CONTRACT:

### UNCLASSIFIED REPORT

Storage	methods,		
batteries,	ints, Test	les(Data)	uation
cadmium	Compone	ng). Tab	nce eval
*Nickel	Spacecraft	(Engineeri	Performa
DESCRIPTORS: *Nickel cadmium batteries, Storage	batteries, Spacecraft components, Test methods	Performance (Engineering), Tables (Data)	IDENTIFIERS: Performance evaluation

33

The report describes testing and performance of 20.0 ampere-hour Ni-Col spacecraft batteries.

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#### UNCLASSIFIED

. ZOMOZ .	0- 771 753 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE
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DDC REPORT BIBLIOGRAPHY	10/3 SCIENCE
REPORT	753 FOREIGN
DDC	D- 771 753 ARMY FORE

3 Storage Batteries of Tomorrow.

NOV 73 11P REPT. NO. FSTC-HT-23-195-71

### UNCLASSIFIED REPORT

3

SUPPLEMENTARY NOTE: Trans. of Moldy Technik (Poland) n11 p38-45 1968, by P. Julius. DESCRIPTORS: \*Storage batteries, \*Electrolytic cells, Translations, Poland IDENTIFIERS: Reviews

33

commonly known types of storage batteries and ceils have been subject to significant modernization. Characterization of these designs is presented in this article, with greater attention given to storage batteries and the newest, most modern electric In recent years many interesting changes have been noted in the field of storage battery and electric cell design. New designs have appeared and the

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UNCLASSIFIED

AD- 771 753

AD- 771 843

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

MOLECULAR ENERGY CORP MURRAY HILL N J

Construction of 850 and +,000 Ampere-Hour Silver-Zinc Cells Using Inorganic Separator.

Ξ

DESCRIPTIVE NOTE: Final rept. Jul 72-Oct 73, DEC 73 32P Grun, Charles; REPT. NO. MEC-10-73 N00024-73-C-5043 REPT. NO.

### UNCLASSIFIED REPORT

Military requirements, Performance (Engineering), DESCRIPTORS: \*Silver zinc batteries, Separators, Design, Manufacturing

3 using government supplied inorganic separator 3420-25-FM was constructed and cycled for 120 50% cycles. Test results are discussed. Two 850 constructed using the inorganic 3420-25-FM separator. Testing of these cells will be carried out by the government for use in submersible Cycles. Test results are discussed. Iwo but A.H. Cells (NR-1 type) and two 4,000 A.H. (Dolphin type) Silver-Zinc cells were A 30 ampere-hour (A.H.) Silver-Zinc cell vehicles. (Modified author abstract)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY 1-771 347 10/3 22/2 AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB

Evaluation Program for Secondary Spacecraft Cells. Initial Evaluation Tests of Eagle-Picher Industries, Incorporated 3.0 Ampere-Hour Nickel-Cadmium Spacecraft Cells,

E

Harkness, J. D. CONTRACT: NASA Order-5-23404-G OCT

### UNCLASSIFIED REPORT

JESCRIPTORS: \*Spacecraft components, \*Nickel cadmium batteries, Performance(Engineering), Storage DESCRIPTORS: patteries

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The purpose of this evaluation test program is to insure that all cells put into the life cycle program are of high quality by the screening of cells found to have electrolyte leakage, internal snorts, low capacity, on inability of any cell to recover its open circuit voltage above 1.150 volts on the cell short test. The five cells were purchased by Philco-Ford for the National Aeronautics and discharge. Requirements are referred to as normal expectant values based on past performance of aerospace nickel-cadmium cells with demonstrated life Test limits specify those values in which a cell is proposed flight battery on the Synchronous Meteorological Satellite to be launched in 1974. These cells are rated at 3.0 ampere-hours (EP Lot fitted with pressure transducers prior to testing. no. 4), contain double ceramic seals, and were to be terminated from a particular charge or Center. The cells are to be evaluated for a Space Administration, Goddard Space Flight characteristics.

UNCLASSIFIED

157

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

ND- 770 970 7/4
ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE
VA

Carbonate Impurities in the Active Masses of Nickel--Cadmium Batteries, (U)

NOV 73 7P Kloss,A. I. ;Nosovelova,V. D. :
REPT. NO. FSTC-HT-23-1760-72

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Vsesoyuznyi Nauchni-Issledovatelskii Akkumuliatornyli Institut. Sbornik Rabot po Khimicneskim Istochnikam Toka (USSR) n4 p43-47 1969.

DESCRIPTORS: \*Nickel cadmium batteries, \*Carbonates, Thermogravimetric analysis, Imputities, Electrodes, Electrolytes, Translations, USSR (U)

This translation investigates the components of carbonate impurities in the active masses of nickel-cadmium batteries. It is shown here that the positive active mass contains potassium carbonate. Nickel hydroxide adsorbs carbon dioxide in the air, and on contact with the electrolyte, carbonizes it. The negative active mass basically contains carbonates in the form of cadmium carbonate. (U)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 770 721 10/3 ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE VA

Method of Using a Sealed Storage Battery,

3

JAN 73 5P Berkman, E. A. REPT. NO. FSTC-HT-23-1177-72

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Patent (USSR) 267 713, 18 Aug 70, Opisanie Izobreteniya k Avtorskomu Svidetelstvu.
DESCRIPTORS: \*Storage batteries, Battery chargers, USSR, Patents, Translations, Silver, Cadmium,

USSR, Patents, Translations, Silver, Cadmium, Circuits IDENTIFIERS: Charging, \*Silver cadmium cells

33

The Russian invention outlines a new technique for charging a sealed, silver-cadmium storage battery so as to assure its full capacity during charging. Charging may be conducted either using an amp-perhour meter or on a time basis (duration depending on the strength of the charging current).

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB

Evaluation Program for Secondary Spacecraft Cells. Synchronous Orbit Testing of General Electric Company 6.0 Ampere-Hour Sealed Nickel-Cadmium Cells,

Christy, D. E. OCT 73 47P REPT. NO. QEEL/C-73-302

### UNCLASSIFIED REPORT

33 \*Nickel cadmium batteries, \*Spacecraft components, Performance(Engineering), Synchronous satellites, Electric current, Temperature, Space simulation chambers, Voltage, Computer aided analysis Sun ight IDENT I FIERS: DESCRIPTORS:

maintaining a position over a fixed point on earth as the earth rotates on its axis and revolves about the cadmium cells operating under a synchronous orbit regime. Such a regime simulates a space satellite performance information concerning sealed nickel-The purpose of this evaluation is to gather

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DUC REPORT BIBLIDGRAPHY

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE 10/3 AD- 770 533

3 Reversibility of Lead Electrodes in Alkaline Electrolytes.

Sidorov, V. A. ; Flerov, V. N. ; REPT. NO. FSTC-HT-23-1014-73 8 73

3

### UNCLASSIFIED REPORT

\*Alkaline batteries, Performance(Engineering), Electrolytes, Silicates, Oxides, Cadmium compounds, USSR, Translations, Storage batteries, Silver, Additives IDENTIFIERS: Cadmium oxides, Lead oxides SUPPLEMENTARY NOTE: Trans. of Izvestiya Vyashikh Uchebnykh Zavedenii. Khimiya i Khimicheskaya Tekhnologiya (USSR) v14 n9 p1393-1396 1971. DESCRIPTORS: \*Electrodes, \*Lead(Metal),

33

3 storage battery is increased by the addition of CdO to the Pb electrode and by addition of Na2SiO3 solution to the KOH electrolyte. The use of the Pb electrode in an Ag-Pb

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE

Alkaline Galvanic Cell,

3

Lidorenko, Nikolai Stepanovich ;Penkova, Lidia fedorovna ;Koval, Ivan Ivanovich ;Nabuillin, Faat Khatovich ;Busova, Zoja 6 P Mikhailovna ;

FSTC-HT-23-1180-72

### UNCLASSIFIED REPORT

Germany) 1,596,165.
DESCRIPTORS: (\*DRY BATTERIES, \*PATENTS), PRIMARY BATTERIES, USSR, WEST GERMANY IDENTIFIERS: TRANSLATIONS SUPPLEMENTARY NOTE: Trans. of Patent (West

33

 $\widehat{\Xi}$ 6 cylindrical shape, naving an outer positive electrode, a hollow negative electrode within the former and separated from it by an ion-conductive separator wall, said negative electrode being made zinc paste, and a tubular current lead for output with friction attachment, fitted within the hollow The invention covers an alkaline galvanic cell of interior of the negative electrode, electrically connected to the negative current takeoff.

#### UNCLASSIFIED

ZOWOZ SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

GTE LABS INC WALTHAM MASS 10/2 AD- 767 624

Lithium Battery with Inorganic Electrolyte.

3

DESCRIPTIVE NOTE: Final rept. 1 Dec 71-31 May 73, SEP 73 61P Auborn, James J. ;French, Kenneth W. ;Heller, Adam ;Lieberman, Sheldon ;

CONTRACT: DAAB07-72-C-0060 ECOM 0060-F-72 MONITOR:

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*PRIMARY BATTERIES, LITHIUM), CHLORIDES, PHOSPHORUS COMPOUNDS, SULFUR COMPOUNDS, ELECTROLYTES, CATHODES, COMPATIBILITY, DXYCHLORIDES, LITHIUM COMPOUNDS, ELECTRICAL CONDUCTIVITY IDENTIFIERS: \*LITHIUM CELLS, HIGH ENERGY BATTERIES,

THIONYL CHLORIDE

such as chlorine, can be electrochemically reduced at Using inorganic oxyhalides as solvents for the electrolytic solutions have been operated at room temperature. Lithium metal can be electrodeposited from these solutions accompanied by the simultaneous electrogeneration of chlorine at the positive electrode. The resulting lithium/chlorine Ç act as cathode depolarizers. This electrochemical reduction of the solvent results in cells with extremely stable voltages and high-energy densities halogen/graphite, nonmetallic and metallic cathode while stable to lithium metal and strong oxidants electrochemical cell has an open circuit voltage various catalytic surfaces (such as carbon) and A series of lithium anode electrochemical cells excess of 4 volts. A group of halogen/platinum, Systems are described. The solvents themselves,

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 767 584 18/14 10/2 14/2 AIR FORCE WEAPONS LAB KIRTLAND AFB N MEX Lincoln Experimental Satellites 8 and 9 Hot
Drop Tests.
(U)

DESCRIPTIVE NOTE: Technical rept. 21 Apr-7 Jul 72, OCT 73 40P Tate, David L.; Zigler,

Gilbert L.; REPT. NO. AFWL-TR-73-171

PROJ: AF-425A

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*RADIOISOTOPE BATTERIES, \*DROP TESTS),
(\*COMMUNICATION SATELLITES(ACTIVE), AUXILIARY POWER
PLANTS), RADIOACTIVE ISOTOPES, ELECTRIC POWER
PRODUCTION, SAFETY, PLUTONIUM
IDENTIFIERS: LES-8 SATELLITE, NUCLEAR
AUXILIARY POWER UNITS, PLUTONIUM 238, \*RADIOISOTOPE
THERMOELECTRIC DEVICES, C-130A AIRCRAFT
(U)

An adequate nuclear safety evaluation is conducted for any USAF launched mission which uses nuclear powered electrical generators. The Lincoln Experimental Satellites B and 9 (LES 99) are such a mission. The total inventory of plutonium-238 is in excess of 280,000 curies. Terminal velocity and impact orientation of the radioisotope thermoelectric generators (RTG) are required.

Actual drop tests of simulated models were deemed the most appropriate and expeditious method for obtaining the necessary basic data. Two electric furnaces mounted on the cargo ramp of a C-130A aircreft were used in the conduct of the tests.

Simulated components of the RTGs were dropped on White Sands Missile Range (WSMR), some at about 1500F. Optical and radar tracking along with motion picture coverage provided the necessary information on velocity and orientation. The hot body effect was observed, i.e., identical objects fell some 18 percent slower when dropped after being heated to about 1500F as opposed to those dropped at ambient temperature. The tests were completed at ambient temperature. The tests were completed.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 765 324 10/3
NAVAL AMMUNITION DEPOT CRANE IND

Effects of Water Salinity and Temperature on MK 72 Sea Water Battery Function, (U)

JUL 73 22P Sanders, Tom J.; Inman, J.; Schantz, S.;

REPT. NO. NAD-CR-RDTR-242 MONITOR: GIDEP 102.80.00.00-x9-01

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, \*PYROTECHNICS), WATER ACTIVATED BATTERIES, TEST METHODS, SEA WATER, SIGNALS, (U)SIGNALS
IDENTIFIERS: RESERVE BATTERIES, \*SEA WATER

DENITIERS: RESERVE BALLERIES: \*SEA WALER

(U)

Non-ignition failures occurred during acceptance testing of Lot 2-KC-72 of Mk 25 Marine Location Markers (MLM) from the Kilgore Corporation at NATC Patuxent River, Maryland (Pax River). Previous testing at NAD Grane in standard sea water solution had proven successful. A detailed study of the Mk 72 Sea Water Battery as conducted to observe the relationship between solution temperature and salinity and the resulting voltage obtained from the battery. Tests conducted with the battery drop test fixture as specified by OS 8755 indicated, at a temperature of 40F, a minimum salinity of 1.5 percent was necessary to enable the battery to meet specifications. (Modified author abstract)

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

25 10/3 ESB INC YARDLEY PA

Magnesium Film Study.

9

DESCRIPTIVE NOTE: Semiannual rept. no. 1, 15 May-15 R. ; Doe, J. B. ; Hull, M. H. ; CONTRACT: DAABO7-72-C-0184 PRQJ: 1-T-662705-A-053

MONITOR: ECOM 0184-5-72

### UNCLASSIFIED REPORT

3 UESCRIPTORS: (\*DRY BATTERIES, \*ANODIC COATINGS), (\*MAGNESIUM, DRY BATTERIES), HYDROXIDES, MAGNESIUM DXIDES, FILMS, CORROSION, PRIMARY BATTERIES, SURFACE PROPERTIES, CHROMATES, RELIABILITY(ELECTRONICS) IDENTIFIERS: \*MAGNESIUM CELLS, MAGNESIUM HYDROXIDE

 $\tilde{\epsilon}$ 

3 the magnesium dry cell anode prior to and during storage, and during discharge, for the purpose of eliminating or reducing the delayed action and the unproductive corrosion encountered in the magnesium dry cell. Special emphasis is placed upon correlation of test data with applicable dry cell The report discusses a study of the structure and parameters. (Modified author abstract)

#### UNCLASSIFIED

ZOM02 SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE

Repair of Stationary Lead-Acid Storage Batteries,

3

Ustinov, P. I. MAR 73 97P USti REPT. NO. FSTC-HT-23-138-73 PROJ: FSTC-T7023012301

### UNCLASSIFIED REPORT

Statsionarnykh Svintsovo-Kislotnykh Akkumulyatorov, SUPPLEMENTARY NOTE: Trans. of mono. Remont

HANDBOOKS, SAFETY, USSR IDENTIFIERS: \*LEAD ACID BATTERIES, TRANSLATIONS MOSCOW, 1971 96p.
DESCRIPTORS: (\*STORAGE BATTERIES, MAINTENANCE),

33

The Russian booklet sets forth procedures of

3 repairing stationary lead-acid storage batteries. Repair operations without plate replacement and operations that must be performed with plates replaced are examined. The booklet is intended for a wide readership of electricians servicing electrical installations. (Author)

PAGE

UNCLASSIFIED

UNCLASSIFIED

ZOM02

Analysis of Electrochemical Energy Source for Military Diver Heating.

3

Howard, Paul L. DESCRIPTIVE NOTE: Final rept., CONTRACT: N62399-73-C-0010 NCEL CR-73.016 25 MONITOR:

### UNCLASSIFIED REPORT

3 (\*HEATERS, \*ELECTROCHEMISTRY), (\*UNDERWATER EQUIPMENT, HEATERS), (\*DIVING, HEATERS), MAGNESIUM, STEEL, STORAGE BATTERIES, REACTION KINETICS, SEA WATER, WATER ACTIVATED BATTERIES, CATHODES (U. IDENTIFIERS: \*MAGNESIUM CELLS, \*SEA WATER DESCRIPTORS:

Theoretical available energy is 3025 WHr/Lb. of Magnesium. The present system is a single multiplate cell with all plates shorted. A heat exchanger unit and circulating system transfer the available heat to the diver. Control may be either in the cell or in the heat exchanger. The report primarily discusses the electrochemistry of the battery as an electrochemical energy source for military divers heating shows it is practical. An analysis of a shorted Mg-steel seawater system.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

- 762 602 10/3 22/2 NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB AD- 762 602

3 DESCRIPTIVE NOTE: Annual rept. no. 9, MAY 73 271P Christy, D. E. : Harkness, J. Evaluation Program for Secondary Spacecraft Cells.

REPT. NO. QEEL/C-73-4 NASA-S-23404G PROJ:

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Report on Cycle Life Test.

3 See also AD-738 880.
DESCRIPTORS: (\*STORAGE BATTERIES.
RELIABILITY(ELECTRONICS)), (\*SPACECRAFT COMPONENTS,
STORAGE BATTERIES), ENVIRONMENTAL TESTS, SPACE
ENVIRONMENTS, TEMPERATURE, TEST METHODS, NICKEL, SILVER,

3 IDENTIFIERS: ZINC CELLS, LIFE TESTS, \*NICKEL CADMIUM BATTERIES, CADMIUM CELLS, SILVER CADMIUM CELLS

3 used by spacecraft power systems planners, designers, performance characteristics and limitations which is that all cells put into the life cycle program meet general performance tests to determine the limit of their actual capabilities. The evaluation program The report covers the cycle life test of the evaluation program of secondary spacecraft cells, through 14 December 1972. The acceptance tests The purpose of the acceptance tests is to insure and general performance tests of the evaluation purchase contracts. A sample number of cells of gathers statistical information concerning cell program were reported earlier where applicable. each type (usually five) are subjected to the the specifications outlined in the respective and integration teams.

3

AD- 762 602

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 762 573 10/3 YARDNEY ELECTRIC CORP PAWCATUCK CONN

New Mechanically Rechargeable Zinc/Air Battery Design.

3

DESCRIPTIVE NOTE: Final rept.,

APR 73 94P Chireau, Roland F.;

CONTRACT: DAAB07-71-C-0333

PROJ: DA-1-T-662705-A-053

TASK: 1-T-662705-A-05302

### UNCLASSIFIED REPORT

MONITOR: ECOM 0333-F-73

DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), PRODUCTION, RELIABILITY(ELECTRONICS), SPECIFICATIONS, ZINC, AIR, POLARIZATION
IDENTIFIERS: \*ZINC AIR CELLS, \*METAL AIR BATTERIES, ENGINEERING DRAWINGS (U)

The report discusses a program of study, design and development leading to the fabrication of new high performance 20 amphere hour mechanically rechargeable zinc/air batteries capable of meeting the requirements listed in the U.S. Army new mechanically rechargeable zinc/air battery design, dated 25 August 1970. Presented is information on the testing, design, specifications, and fabrication of the battery. Portions of this document are not fully legible.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7 AD- 761 281 7/4

D- 761 281 7/4 WATERLOO UNIV (ONTARIO) DEPT OF PHYSICS

An Optical Study of the Growth and Oxidation of Nickel Hydroxide Films,

3

SEP 72 6P Hopper, M. A. ; Ord, J. L.

### UNCLASSIFIED REPORT

Availability: Pub. in Electrochemical Science and Technology, v120 n2 p183-187 Feb 73.
SUPPLEMENTARY NOTE: Revision of report dated 9 May 72.

DESCRIPTORS: (\*NICKEL COMPOUNDS, \*ELECTROCHEMISTRY),
ALKALINE BATTERIES, ELECTRODES, HYDROXIDES, OXIDATION,
CANADA
IDENTIFIERS: NICKEL CADMIUM BATTERIES, \*NICKEL
HYDROXIDE, ELLIPSOMETRY
(U)

The formation and oxidation of nickel hydroxide films under a variety of experimental conditions are studied using in situ ellipsometric measurements. Iwo forms of the hydroxide, which we assume to be the alpha and beta forms reported by other workers, are found. The alpha and beta-hydroxide layers are found. The alpha and beta-hydroxide layers are both transparent with real refractive indices of 1.52 and 1.46, respectively, at 63284. Upon oxidation the two forms of hydroxide convert to different oxides, both of which absorb light. The process involved in the conversion of the beta-hydroxide appears to be similar to the process bostulated for the charging of the nickel battery electrode. (Author)

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AD- 762 573

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Ö

FAGLE-PICHER CO JOPLIN MO COUPLES DEPT AD- 761 186

850 AND 4000 A.H. Secondary Silver-Zinc Ce 118.

DESCRIPTIVE NOTE: Engineering rept. (Final), APR 73 4P Rupp, John; CONTRACT: N00024-73-C-5069

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, STARTING), HYDROXIDES, ELECTROLYTES, SILVER, ZINC IDENTIFIERS: ZINC CELLS

33

The brief report is in reference to the activation and cycling of the 850 and 4000 ampere-hour cells supplied Eagle-Picher Industries, Inc. It describes how to activate these cells.

3

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

1- 759 932 10/3 YARDNEY ELECTRIC CORP PAWCATUCK CONN AD- 759 932

Water Activated Zinc-Air Standard Line

3

DESCRIPTIVE NOTE: Final rept. Oct 69-Nov 72, Battery BA-535/PRC-70.

3

MAR 73 66P Seidman, Sandy; CONTRACT: DAAB07-70-C-0057 PROJ: DA-1-T-662705-A-05302 MONITOR: ECOM 0057-F

### UNCLASSIFIED REPORT

Availability: Available in microfiche only. DESCRIPTORS: (\*PRIMARY BATTERIES, ZINC), DESIGN, RELIABILITY(ELECTRONICS), AIR, TEST METHODS IDENTIFIERS: \*ZINC AIR CELLS, \*METAL AIR BATTERIES

3 3

> The report describes the design, development, and fabrication of the BA-535/PRC-70 battery which is adaptable for use as either a 12.0 or a 24.0 volt system. The unit has a rated capacity of 20 ampere hours at 24 volts and 40 ampere hours when discharged activated by the addition of water. Since the BA-535/PRC-70 is a primary system, it is to be used once and then discarded. Although the battery was primarily designed for use with the PRC-70 Field Radio System, it has been tested at other cell (dual cathode) system and are designed to be at 12.0 volts. The batteries make use of the bioperating regimes. (Modified author abstract)

3

AD- 759 932

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY 759 754 10/3
ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE

3 Method of Manufacturing a Nonlamellar Cadmium Electrode of an Alkali Storage Battery (Sposob Izgotovleniya Bezlamelnogo Kadmiego Elektroda Shcheluchnogo Akkumulyatora),

Kloss, A. I. ; Novoselova, V.

D. ; REPT. NO. FSTC-HT-23-1176-72

### UNCLASSIFIED REPORT

3 Matters of Inventions and Discoveries, Moscow, 22 DESCRIPTORS: (\*STORAGE BATTERIES, \*ELECTRODES),
MANUFACTURING, ORGÁNIC SOLVENTS, USSR
IDENTIFIERS: \*BATTERY ELECTRODES, \*CADMIUM CELLS,
TRANSLATIONS SUPPLEMENTARY NOTE: Trans. by Committee for the

3

3 manufacturing nonlamellar cadmium electrode of an alkali storage battery by way of soaking a baked porous base in a solution of cadmium salt, alkali, and a solution of solar oil, for example in gasoline. In order to raise specific electric characteristics at negative temperatures and discharge by high current densities, soaking in solar oil is performed in its 3 to 6% solution immediately before The brief Russian patent describes a method of assembling electrodes in the storage battery. (Author Modified Abstract)

MKDMOXIDES, EFECTEDIALES SITAES SIVELING)

M00034-13-C-2000

#### UNCLASSIF1ED

SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

GOULD INC MENDOTA HEIGHTS MINN GOULD LABS AD- 759 218

2-Pound Disposable Zinc-Air Battery, Non-Reserve BA-558()/U, 3.3-Pound Disposable Zinc-Air Battery, Non-Reserve, BA-559(A)/U.

3

Cretzmeyer, John W. ; DESCRIPTIVE NOTE: Final rept. Apr 70-Nov 72, APR 73 43P Cre CONTRACT: DAABO7-70-C-0167 PROJ: DA-1-T-062705-A-053 TASK: 1-T-062705-A-05302 MONITOR: ECOM 0167-F

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*PRIMARY BATTERIES, ZINC), AIR, RELIABILITY(ELECTRONICS), DESIGN, ELECTRODES IDENTIFIERS: \*ZINC AIR CELLS, ZINC CELLS, BA-558()/UBATTERIES BATTERIES

of two disposable zinc-air, non-reserve batteries. The BA-558()/U is a 2-pound, 14 volt, 15 ampere-hour unit. The BA-559(A)/U is a 3.3 pound, 24 volt, 15 ampere-hour unit. Performance and mechanical tests as delineated in Electronics Command Development Description El-CD2078-0014 7 July 1969 for BA-558()/U and Proposed Performance Specification, 23 August 1972 for BA-559(A)/U were accomplished and all criteria were exceeded. The report contains the individual test results and the details of the construction of the batteries. (Author Modified The research described resulted in the development Abstract)

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CHOCKYSZILLED BEBORL

CONTRACT: DAABOY-10-C-005

1-1-665102-7-02303

MONITOR: ECOM . 0083-6

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AD- 759 754

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920 MMD 4000 W'H"

#### PAGE

### AD- 758 856

#### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE

Hermetically Sealed Alkaline Galvanic Element of Zinc Nanganese System,

3

Lidorenko, N. S. ; Penkova L. F. ;Kpav.I. I. ;Nabiullin, F. Kh. ; FSTC-HT-23-1978-72 Buzova, Z. M.

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Patent (USSR) 276 192, 29 Sep 70. Also pub. as Opisanie Izobretaniya k Avtorskomu Svidetelstvu (sic) no. 276192, 29 Sep

(\*STORAGE BATTERIES, ZINC), (\*ELECTRODES, STORAGE BATTERIES), DESIGN, RELIABILITY (ELECTRONICS), ALKALINE BATTERIES, USSR, PATENTS (DENTIFIERS: \*ZINC CELL:, \*MANGANESE ZINC CELLS, DESCRIPTORS:

TRANSLATIONS

3 the negative electrode which is constructed in the form of a tube, from sheet metal which is coiled into electrode has a metal current tap and is located in electrode is separated by a cellophane diaphragm. The invention characterized by the current tap of a spiral. The cavity within this serves as a gas The Russian invention involves a hermetic zincmanganese alkaline cell in which the negative the cavity of the positive electrode. The

#### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N 10/3 AD- 758 856

Lithium-Inorganic Electrolyte Battery Systems.

3

Christopulos, John ; Ramirez, Maria ; Gilman, Sol ; Behl, Wishvender K. DESCRIPTIVE NOTE: Technical rept., REPT. NO. ECOM-4101 PROJ: DA-1-T-061102-A-34-A APR 73

### UNCLASSIFIED REPORT

1-T-061102-A-34-A-02

PROJ:

3 3 IDENTIFIERS: LITHIUM CELLS, \*LITHIUM CHLORINE CELLS, PHOSPHORUS(V) OXYCHLORIDE, TETRAFLUOROETHYLENE RESINS, \*THIONYL CHLORIDE, DEPOLARIZATION ELECTROLYTES, ELECTRODES, OXYCHLORIDES, PHOSPHORUS COMPOUNDS, CARBON, ELECTROCHEMISTRY, POLARIZATION, LITHIUM COMPOUNDS, RELIABILITY(ELECTRONICS), ( \* BATTERY COMPONENTS, \*LITHIUM), (U)RELIABILITY (ELECTRONICS)

3 these cells is also compared with the performance of SOC12, are electrochemically reduced and behave as depolarizers. Based on total cell weight, a prototype cell, with a 1.5 molar solution of LiAIC14 in SOC12 as the electrolyte, yielded an experimental energy density of 244 Wh/lb for a 57-hour discharge rate (20 mA constant current, 1 mA/sq cm current density). The performance of (Teflon)-bonded carbon black electrodes as cathodes. A novel feature of these cells is that during discharge the solvents, i.e., POCI3 and temperature lithium cells employing solutions of monofluoride and lithium-inorganic electrolyteprototype lithium-organic electrolyte-graphite The report describes a study of prototype room electrolytes and polytetrafluoroethylene tetracarbon monofluoride cells. (Author) LiBC14 in POC13 and LiAIC14 in SOC12 as

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

TYCO LABS INC WALTHAM MASS AD- 758 171

3 Low Temperature Electrochemical Systems.

DESCRIPTIVE NOTE: Semiannual technical rept. no. 2, Malachesky, Paul A.; Cahill, PROJ: PRON-C8-1-04407-01-68-CA CONTRACT: DAABO7-71-C-0291 39P Jul-31 Dec 72, Kathleen ;

### UNCLASSIFIED REPORT

MONITOR: ECOM 0291-3

ELECTRODES, AIR, ELECTROCHEMISTRY,
RELIABILITY(ELECTRONICS), CATALYSTS, HEAT OF ACTIVATION,
PLATINUM, HALOGENATED HYDROCARBONS, SURFACES, ALKALINE
BATTERIES 3 SUPPLEMENTARY NOTE: See also report dated May 72, AD-(\*LOW TEMPERATURE BATTERIES, ZINC), \*ZINC AIR CELLS, \*METAL AIR DENTIFIERS: BATTERIES

3 produced which show improved performance over present of air alectrodes for use in zinc-air and other metal-air battery systems have been continued in the areas of electrode structure and electrolyte modifications. The effects of such variables as loading have minimal effects, electrocatalyst characteristics and electrode preparation procedures Investigations into the low temperature performance air electrode types. Carbonate and zincate have deleterious effects on air electrode performance, Teflon content, catalyst loading, and catalyst characteristics have been examined. While variations in Teflon content and electrocatalyst KOH electrolyte appears to result in better low temperature air electrode operation. (Author) particularly at low temperatures (-40C). The use of a CsOH electrolyte as a substitute for do have appreciable effects on air electrode performance. Electrode structures have been

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

7/2 10/3 NAVAL DRDNANCE LAB WHITE DAK MD

Preparation and Purification of Flinak,

3

Green, G. L. ; Hunt, J. REPT. NO. NOLTR-72-245 PROJ: MAT-03L-000/ZR00-001-010 :Sutula, R. ;

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*THERMAL BATTERIES, \*ELECTROLYTES), (\*FLUCRIDES, PURIFICATION), ALKALI METAL COMPOUNDS, DRYING, BROMINE COMPOUNDS, IMPURITIES, IDENTIFIERS: \*ELECTROLYTES, \*FUSED SALTS, BROMINE FLUORIDE(BRFS)

3

The report describes a technique for preparing and purifying the fluoride salt eutectic of Lif, NaF, and KF (Flinak) which has been bromine pentafluoride, BrF5, to react with and to remove water and oxide impurities in the Flinak. in this manner was performed, and the results are compared to those obtained by other currently employed purification techniques. (Author) Quantitative analysis of Flinak samples purified proposed for use as the electrolyte in a thermal battery system. The method involves the use of

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AD- 758 001

AD- 758 171

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# DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 757 883 10/3 ATOMICS INTERNATIONAL CANGGA PARK CALIF New Cathode Material for High Energy-Density Batteries.

3

JAN 73 31P Nicholson, Margie M. REPT. NO. AI-72-50. Scientific-1

PROJ: AF-8659 TASK: 865904

MONITON: AFCRL 72-

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*SIORAGE BATTERIES, CATHODES(ELECTROLYTIC CELL)), (\*SEMICONDUCTORS, \*CATHODES(ELECTROLYTIC CELL)), PORQUS MATERIALS, FLUORIDES, ZINC COMPOUNDS, RELIABILITY(ELECTRONICS)

DENTIFIERS: ZINC FLUORIDE, \*LITHIUM CELLS, LITHIUM PERCHLORATE, ORGANIC BATTERIES, CADMIUM FLUORIDE, PASSIVITY, PC(PROPYLENE CARBONATE), PROPYLENE CARBONATE, \*HIGH ENERGY BATTERIES (U)

Semiconductive metal halides are under investigation as cathode materials for ambient-temperature lithium cells. N-type cadmium fluoride and zinc fluoride were further characterized as electrodes limited by cathodic passivation in a lithium perchlorate-propylene carbonate electrolyte. The discharge of cadmium fluoride occurred without passivation, however, in a tetramethylammonium hexafluorophosphate solution in the same solvent. The result confirms previous evidence that an alkali metal fluoride film was the cause of passivation in the cade of cadmium fluoride and shows that the use of this material can be greatly increased by the elimination of alkali metal ions from the electrolyte. Zinc fluoride did not show a corresponding improvement. Performance estimates for porous cadmium fluoride cathodes indicate that the Li-CdF2(n-type) cell in TMA:PF6-PC may be superior to other organic-electrolyte systems where high power densities are required.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 757 535 10/3 1/3
GULTON INDUSTRIES INC HAWTHORNE CALIF ENGINEERED MAGNETICS
DIV

Maintenance Free Battery System, Model No. EMBC114C. Battery System, Sealed Cell, Nickel Cadmium, Integral Charge Control, Aircraft.

3

DESCRIPTIVE NOTE: Final rept.,
DEC 72 243P Grasmehr, Thomas W.; Newman,
William; Pierce, Thomas;
CONTRACT: F33615-70-C-1737
PROJ: AF-3145

### UNCLASSIFIED REPORT

MONITOR: AFAPL TR-72-85

DESCRIPTORS: (\*AIRCRAFT EQUIPMENT, \*STORAGE BATTERIES), (\*POWER SUPPLIES, AIRCRAFT EQUIPMENT), LOGIC CIRCUITS, BATTERY CHARGERS, RELIABILITY(ELECTRONICS), WIRING DIAGRAMS, DESIGN, MAINTENANCE IDENTIFIERS: \*NICKEL CADMIUM BATTERIES (U)

The program covers work performed on the EMBC114C Maintenance Free, Nickel-Cadmium Battery System. The EMBC114C consists of a hermetically sealed nickel-cadmium battery and an associated control logic and charger circuit. The Battery System is compatible with existing aircraft electrical systems and may be operated at altitudes up to 100,000 feet. The system is a two-terminal device connected in parallel with the aircraft 28 vdc power. This system was modified to reduce EMI and minimize bus power interruptions when switching from charge to discharge. Tests were performed to verify these modifications. A study was conducted to determine the best charge rate, whether sealed or vented cells were most suitable, and the advisability of using three terminal systems where possible. The EMBC114C is the modified system in accordance with the stated objectives and was qualification tested.

PAGE

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DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 757 440 10/3
ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH N J

Capabilities of Megraphically Rechargeable Zinc Air Batterie

3

3P Bartosh, Stephen J.

72

UNCLASSIFIED REPORT

Availability: Pub. in Annual Proceedings Power Sources Conference (25th), May 72.
DESCRIPTORS: (\*STORAGE BATTERIES, ZINC), AIR, RELIABILITY(ELECTRONICS), TEMPERATURE IDENTIFIERS: \*ZINC AIR CELLS, \*MECHANICALLY RECHARGEABLE BATTERIES, \*METAL AIR BATTERIES (U)

Data obtained on the 24 V, 20 Ah BA-525( )/
U Battery mechanically rechargeable batteries are
well suited for operation under continuous discharge
conditions. The factor which affect performance
under this type of discharge regime are the rate of
discharge and the ambient temperature. The report
discharges this performance.

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 757 438 10/3 ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH N J

Metal-Air (Oxygen) Batteries,

3

72 4P Wagner,Otto C.

aggier, otto c.

UNCLASSIFIED REPORT
Availability: Pub. in Annual Proceedings Power
Sources Conference (25th), May 72. (Session on

Secondary Batteries).
DESCRIPTORS: (\*STORAGE BATTERIES,
RELIABILITY(ELECTRONICS)), ELECTRODES, AIR, ZINC,
CADMIUM

IDENTIFIERS: \*ZINC AIR CELLS, \*METAL AIR BATTERIES, \*CADMIUM AIR CELLS

3 3

Cells using the zinc-air system can be designed to give an energy density of 75 Wh/lb. The cost of cell components is inexpensive. The energy density of experimental sealed zinc-oxygen cells has approached 60 Wh/lb. However, at the present time, both types of zinc cells have a limited cycle life because of the limitations of the separator materials and the zinc electrode. The cadmium-air cell has demonstrated an energy density of 45 Wh/lb and a useful life of at least 500 cycles. The drawback for major use of this system is that the cost of cell components is rather expensive if the bifunctional platinum-catalyzed air catnodes are employed. The report describes the operation of these batteries. (Author Modified

3

Abstract)

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH 10/3 AD- 757 318

Session on Primary Batteries. Organic Electrolyte Batteries,

3

Wilburn, Nicholas T. 36

### UNCLASSIFIED REPORT

Sources Conference (25th), 3p May 72.

DESCRIPTORS: (\*STORAGE BATTERIES, LITHIUM), (\*PRIMARY BATTERIES, LITHIUM), (\*PRIMARY STORAGE, THERMAL STABILITY (ELECTRONICS), Availability: Pub. in Annual Proceedings Power IDENTIFIERS: \*LITHIUM CELLS, \*ORGANIC BATTERIES

3 The lithium-organic electrolyte battery is one of the major current development areas in power sources. This battery has been of great interest for many years because of its potentially high energy density. In the last two years it has been shown as well to characteristics to make it a practical and highly desirable power source. The report reviews this battery and its performance characteristics. have the rate, temperature, and storage

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB FORT MONMOUTH 10/3 AD- 757 296

Primary-Secondary Battery Hybrid Systems

3

Sulkes, Martin

### UNCLASSIFIED REPORT

Sources Conference (25th), Session on Secondary Availability: Pub. in Annual Proceedings, Power Batteries, May 72. DESCRIPTORS: (\*PRIMARY BATTERIES,

RELIABILITY(ELECTRONICS)), (\*STORAGE BATTERIES, RELIABILITY(ELECTRONICS)), TRANSMITTER RECEIVERS IDENTIFIERS: MAGNESIUM MANGANESE DIOXIDE CELLS, MERCURY ZINC CELLS, NICKEL CADMIUM BATTERIES

3 3

> temperature and discharge rates with higher energy and power densities than either battery can produce The report discusses the hybridization of primary batteries, such as Zn-HgG, Mg-MnG2, and Zinc-air with miniature sealed nickel cadmium batteries. This results in a power source that can operate synergistically over a much wider range of alone.

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PAGE

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/2

Rack-Mounted Thermoelectric Power

Source.

Herchakowski, Andrew; DESCRIPTIVE NOTE: Technical rept., REPT. NO. ECOM-4083 PROJ: DA-1-T-062119-A-053

### UNCLASSIFIED REPORT

1-T-062119-A-05301

(U)

POWER GENERATION

(U) DESCRIPTORS: (\*GENERATORS, \*THERMOELECTRICITY), DESIGN, INSTALLATION, SHELTERS, PACKAGING, ALKALINE BATTERIES, POWER SUPPLIES, AIR COOLED, TACTICAL WARFARE, DESCRIPTORS:

3 or van, to power tactical communication equipment are described. The results of operational tests thermoelectric system, fabricated on the basis of one thermoelectric no-break power generating systems, proposed for operating within an integrated shelter conducted on an experimental model of an air-cooled Design concepts of air-cooled rack-mounted of the proposed concepts, are presented. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

NAVAL DRDNANCE LAB WHITE DAK MD 10/2 AD- 757 007

Preliminary Study of a Lithium Aluminum Electrode for Thermal Batteries.

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ď James, Stanley REPT. NO. NOLTR-72-224 PROJ: ORD-333-006-092-1/UF33-13-01 22P

### UNCLASSIFIED REPORT

3 "ESCRIPTORS: (\*THERMAL BATTERIES, \*ELECTRODES), (\*STORAGE BATTERIES, LITHIUM), LITHIUM A'LOYS, ALUMINUM ALLOYS, RELIABILITY(ELECTRONICS), POLARIZATION, DIFFUSION, PHASE STUDIES, PHASE DIAGRAMS
IDENTIFIERS: \*LITHIUM CELLS, ELECTROLYTES, FUSED SALTS, \*HIGH ENERGY BATTERIES

3

3 percent alloy of lithium in aluminum should significantly outperform the calcium anode presently used in thermal batteries. The usable energy and power densities of this solid Li alloy are at least double those of a Ca anode. Aluminum wires were cathodically charged with Li in the LiCI-KCI eutectic melt at 430C. Discharge behavior was charging process to be much less polarized than the discharge. Discharge capacity is inversely related terminated by diffusion polarization. Both charge extensive cracking of the metal, allowing melt to and discharge are possible at high rates due to then studied in the same melt. Data showed the contact a very large electrode area. (Author) Laboratory tests have shown that a 25 weight to discharge rate and shows discharge to be

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PAGE

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE

3 Fluctuation of the Voltage of Batteries during Charging with an Asymmetrical Alternating Current,

FEB 73 7P Bayunov,V. V. REPT. NO. FSTC-HT-23-1758-72

### UNCLASSIFIED REPORT

Supplementary NOTE: Trans, of Vsesoyuznyi Nauchno-Issledovatelskii Akkumuliatornyi Institut. Sbornik Rabot po Khimicheskim Istochnikam Toka (USSR) n4 p125-127 1969.

DESCRIPTORS: (\*BATTERY CHARGERS, ALTERNATING CURRENT), STORAGE BATTERIES, SILVER, ZINC, LEAD(METAL), USSR (U) IDENTIFIERS: ZINC CELLS, \*LEAD ACID BATTERIES, ASYMMETRY, \*SILVER ZINC BATTERY CELLS,

TRANSLATIONS

3

3 batteries being charged with an asymmetrical alternating current. Particular emphasis is placed on chemical reactions within silver-zinc and lead-The authors discuss the basic parameters of acid batteries. (Author)

#### UNCLASSIFIED

ZOWOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N AD- 756 431

Characteristics of Conventional Design Nickel-Zinc Batteries for Hybrid Vehicle Operation.

3

DESCRIPTIVE NOTE: Research and development technical rept.

Sulkes, Martin d. DEC 72 27P REPT. NO. ECOM-4058

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, RELIABILITY(ELECTRONICS)), (\*VEHICLES, STORAGE BATTERIES), NICKEL, ZINC, HEAT, DESIGN, BATTERY SEPARATORS

3 IDENTIFIERS: \*ZINC CELLS, \*NICKEL ZINC CELLS, \*HYBRID VEHICULAR PROPULSION

Preliminary evaluations have been conducted on conventional 35 Ah nickel-zinc batteries for hybrid electric vehicle service. On a pulse type of service, adequate recharge is obtained by constant potential charging at 1.85 V/cell. Discharge voltages of approximately 1.7 V/cell are obtained at a 55 A load. Cycling data are reported for a total 3,300 Ah output (5% of total requirement) and includes discharge voltages at 55 Should generate approximagely 1/2 as much heat. (Author) and 350 A, and charge input. Heat generation approximately 13 Btu/h/cell. Improved cells during cycling for conventional cells is

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AD- 756 431

SEARCH CONTROL NO. ZOMO7 30C REPORT BIBLIOGRAPHY

ENERGY RESEARCH CORP BFTHEL CONN 10/3 10- 755 550

High Energy Sealed Nickel-Zinc

Batteries.

Semi-Annual rept. 1 Mar-1 Sep 72, Charkey, Allen ; DESCRIPTIVE NOTE:

JAN 73 33P Cha ECOM 0114-S MONITOR: UNCLASSIFIED REPORT

3 3 RELIABILITY(ELECTRONICS)), NICKEL, ZINC, DESIGN, ELECTRODES, HYDROXIDES, BATTERY SEPARATORS IDENTIFIERS: \*NICKEL ZINC CELLS, NICKEL HYDROXIDE ELECTRODES, HIGH ENERGY BATTERIES DESCRIPTORS: (\*STORAGE BATTERIES,

3 The construction and performance details for 4 cell batteries evaluated contained non-sintered positive nickel-hydroxide electrodes, Teflonated zinc oxide were about 8.2Ah and yielded an energy density of almost 30Wh/lb. The swelling problems of the binder. Initially the capacities of the batteries sealed nickel-zinc batteries are presented. The negative, Ag/Hg oxygen recombination electrodes and inorganic separators containing a Teflon nickel hydroxide electrode were investigated.

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY AD- 755 159

ARMY ELECTRONICS COMMAND FORT MONMOUTH N Graphite Intercalation Compounds as

Depolarizers in Organic Electrolyte Batteries.

3

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Hunger, Herbert F. ; Heymach, DESCRIPTIVE NOTE: Technical rept., 39P George J.; .5 2 S

REPT. NO. ECOM-4047 PROJ: DA-1-T-061102-A-34-A 1-T-061102-A-34-A-02 TASK: UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*BATTERY COMPONENTS, GRAPHITE), ELECTROCHEMISTRY, OXIDES, FLUORIDES, POLARIZATION, LITHIUM, CATHODES(ELECTROLYTIC CELL), SOLVENT ACTION, (U)SOLVENT ACTION

3 IDENTIFIERS: \*LITHIUM CELLS, \*ELECTRIC BATTERIES, \*ELECTROLYTES, \*ORGANIC COMPOUNDS, \*BATTERY DEPOLARIZERS, GRAPHITE FLUORIDE, HIGH ENERGY BATTERIES, \*INTERCALATION COMPOUNDS

characteristics are presented. A compar son is made of the energy content of the various compounds as a electrolyte/depolarizer cells at noom temperature. The preparation and characterization of the compounds, as well as that of electrolytes and electrodes, are discussed. The kinetics of the intercalation compounds and their discharge function of discharge rate, electrolyte anion, and solvent. Obtainable energy densities of practical investigated as depolarizers in lithium/organic Graphite oxide and graphite fluorides were ceils are estimated. (Author)

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AD- 755 159

PAGE

AD- 754 257

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY AD- 754 257

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE

High-Temperature Impregnation of Sintered-(Vysokotemperaturnaya Propitka Metallokeramicheszikh Osnov Elektrodov Metal Alkaline-Battery Electrodes Shchelochnogo Akkumulyatora),

Pervushin, Yu. N. REPT. NO. FSTC-HT-23-823-72 Skalozubov, M. F. ; 6 P

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Politekhnicheskii Institut, Novocherkassk. Trudy (USSR) v190 p96-100

3 DESCRIPTORS: (\*BATTERY COMPONENTS, \*ELECTRODES), PORGSITY, POWDER ALLOYS, NICKEL ALLOYS, CADMIUM ALLOYS, ALKALINE BATTERIES, IMPREGNATION, HYDROXIDES, USSR,

3 IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, NICKEL(II) HYDROXIDE, TRANSLATIONS

sintered metal under excess vapor pressure eliminates impregnating solution, which increases the weight of nickel hydroxide due to physical filling of the the disadvantages of soaking in highly concentrated weight due to hydroxide formation in the pores. The proposed method of high-temperature impregnation of efficiency of the liquid process used on the sintered-metal alloy. Impregnation of the sintered Sintered-metal Cd-Ni electrodes for alkaline batteries are difficult to make because of the low solution and accelerates the impregnation process increasing the active-metal concentration in the pores, and By increasing the dissolution rate of the sintered metal, which increases the Ni(OH)2 simultaneously in the two ways mentioned above. metal may be increased in two ways: By

### UNCLASSIFIED

ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ENERGY RESEARCH CORP BETHEL CONN AD- 751 751

Secondary Zinc-Oxygen Batteries.

3

Klein, Martin; DESCRIPTIVE NOTE: Final rept., OCT 72 62P K16 CONTRACT: DAABO7-71-C-0249 MONITOR: ECOM 0249-F 62P

3

# UNCLASSIFIED REPORT

33 SUPPLEMENTARY NOTE: See also AD-740 234.
DESCRIPTORS: (\*STORAGE BATTERIES, \*ZINC) DESIGN,
RELIABILITY(ELECTRONICS), BATTERY SEPARAIORS, OXYGEN, ELECTRODES, TITANATES
IDENTIFIERS: \*ZINC CELLS, BATTERY ELECTRODES

3 research and development leading to the construction of a long life high energy density sealed zinc-oxygen secondary battery which is capable of operating over the range of temperatures and rates compatible with testing of lightweight sealed 25 ampere-hour zinc-Optimization of the rechargeable zinc electrodes; Army communications and surveillance equipment. and screening of inorganic separator materials, Investigation of various rechargeable oxygen electrode schemes; and Design, fabrication and Discussed are the following: Investigations The purpose of this contract was to conduct oxygen cells.

Carbon-Based Oxygen Electrodes for Metal-Air Batteries. III. The Carbon-Manganese Dioxide Electrode.

Armstrong, William A. ; DESCRIPTIVE NOTE: Technical note, MAR 72 14P Armstrong MAR 72 14P REPT. NO. DREO-TN-72-2

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, \*ELECTRODES), CARBON, IMPREGNATION, MANGANESE COMPOUNDS, CATHODES(ELECTROLYTIC CELL), RELIABILITY(ELECTRONICS), AIR, ZINC, PRODUCTION, CANADA IDENTIFIERS: \*ZINC AIR BATTERY CELLS, MANGANESE(IV)
OXIDE, \*METAL AIR BATTERIES, ACTIVATED CARBON, BATTERY
ELECTRODES

impregnation of activated carbon with manganese dioxide. The operational characteristics of an air cathode made from this material are superior to those previously reported for the C-MnO2 electrode.

A zinc-air bicell equipped with this cathode operated with an energy density of 89 Wh/lb and The C-MnO2 air cathode appears to be well suited for use in a reserve primary 'throw-away zincdischarged at current densities up to 100 mA/sq cm. maintained a cell voltage greater than 1.0 V when A simple method has been developed for the air battery. (Author)

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 751 018 10/3 15/3 NAVAL ORDNANCE LAB WHITE DAK MD

List of Batteries for U. S. Naval Weapons,

3

Larrick, Benjamin F.; REPT. NO. NOLTR-72-213 PRGJ: ORD-333-301/UF-383-301 36P SEP 72

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### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*BATTERY COMPONENTS, CATALOGS), (\*WEAPON SYSTEMS, BATTERY COMPONENTS), BOMBS, DEPTH CHARGES, MINES(ORDNANCE), DESTRUCTORS, PROJECTILES, GUIDED MISSILES, ROCKETS, TORPEDOES, ELECTROCHEMISTRY, THERMAL BATTERIES, NAVAL RESEARCH, (U)NAVAL RESEARCH IDENTIFIERS: MERCURY BATTERIES

3 weapons under the cognizance of the Naval Ordnance Systems Command is presented. This list is cross-referenced with the weapons in which these batteries are used. The Federal Stock Number, specification and drawing numbers, manufacturer, and electrochemical system are given for each battery. (Author) A list of the batteries used in U. S. Naval

AD- 751 018

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

TYCO LABS INC WALTHAM MASS 10/3 AD- 749 861

Lithium-Nickel Sulfide Batteries.

3

DESCRIPTIVE NOTE: Final rept. 1 Apr 71-31 Mar 72, JUL 72 53P Gaines, Lewis ; Jasinski,

C-929 Raymond

CONTRACT: F19628-71-C-0153

AF-8659 865904 TASK: 865 MONITOR:

AFCRL

# UNCLASSIFIED REPORT

3 SULFIDES, ELECTROLYTES, PERCHLORATES, FURANS, ELECTRODES, OXIDATION, TEMPERATURE, X RAY DIFFRACTION, HALOCARBON PLASTICS, PLASTIC COATINGS, (\*PRIMARY BATTERIES, \*NICKEL COMPOUNDS), RELIABILITY(ELECTRONICS), ORGANIC SOLVENTS, LITHIUM DESCRIPTORS:

3 IDENTIFIERS: LITHIUM PERCHLORATE, LITHIUM CELLS, ORGANIC BATTERIES, FURAN/TETRAHYDRO

3 advantage is compromised by the difficulty of obtaining high coulombic efficiencies from insulating carbonate and butyrolactone solutions indicated rate limitations in the vicinity of 0.5 to 1 mA sq. cm. Study of the Ni3S1 oxidation procedure indicated that the optimum temperature for the production of the high voltage material was 325C. X-ray diffraction analysis of the oxidized Ni3S2 indicated the presence of the relatively sulfur rich nickel sulfides: Ni7S6 and capability was strongly influenced by the viscosity of the cell electrolyte. Stable discharges at up to 6 mA sq. cm. (equivalent to the 5-hr rate for an electrode of typical thickness) were obtained from Teflon-bonded electrodes in a tetrahydrofuran/ LiClO4 electrolyte. Coulombic efficiencies on the order of 50% of theoretical could be obtained at 3 mA sq. cm. Previous results with propylene theoretical energy densities than Ni3S2. This materials. Oxidation of Ni3S2 at temperatures above 400 C results in the formation of NiO. Investigation of the high rate discharge performance of Ni3S2 indicated that rate NiS1.09. These materials possess higher

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

10/3 ESB INC YARDLEY PA

BA-528( )/U Mechanically Rechargeable

Zinc-Air Battery.

3

Aug 72 259P Malaspina,F. P.; Martini, W. J.; N:ederberger,R. P.; Blickwedel,T. W. DESCRIPTIVE NOTE: Final rept., McCormick, R. J.

CONTRACT: DAAB07-69-C-0248 PROJ: DA-1-T-663702-DG-10 TASK: 1-T-663702-DG-1001

MONITOR: ECOM 0248-F

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE BATTERIES, ZINC), AIR, DESIGN, RELIABILITY(ELECTRONICS), ELECTRODES, LOW TEMPERATURE BATTERIES

3 IDENTIFIERS: \*ZINC AIR CELLS, MECHANICALLY RECHARGEABLE BATTERIES, \*METAL AIR BATTERIES

feasibility type model, construction techniques and The report discusses the design and development of anodes. The battery delivers an average of 105 A. H. under continuous discharge of 8.3 amps at 72F. The report presents the results from the development of the zinc air battery which is mechanically rechargeable by inserting new zinc the test results.

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AD- 749 779

ZOMOZ

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

TYCO LABS INC WALTHAM MASS AD- 749 270

3 Low Temperature Electrochemical Systems.

DESCRIPTIVE NOTE: Annual technical rept. no. 1, 1 Jul Malachesky, Paul A. ; Cahill, 89F 71-30 Jun 72. AUG 72 Kathleen ;

REPT. NO. C-153 CONTRACT: DAABO7-71-C-0291 PROJ: PRON-C8-I-04407-01-68-CA MONITOR: ECOM 0291-2

### UNCLASSIFIED REPORT

3 UPPLEMENTARY NOTE: See also AD-742 720.
ESCRIPTORS: (\*LOW TEMPERATURE BATTERIES, \*ZINC),
(\*CATHODES(ELECTROLYTIC CELL), AIR), ELECTROCHEMISTRY,
TRANSPORT PROPERTIES, DIFFUSION, RELIABILITY(ELECTRONICS), TEMPERATURE, CATALYSTS, PLATINUM, CARBON IDENTIFIERS: +ZINC AIR BATTERY CELLS. +METAL AIR SUPPLEMENTARY NOTE: DESCRIPTORS:

BATTERIES

3 In performance at low temperature operation.
Therefore, a detailed study of the pertinent parameters influencing air cathode behavior at reduced temperatures has been initiated. A series of electrode materials of different composition and physical characteristics has been used for the study. occurring in the activation-controlled region of the Zinc-air batteries are subject to a marked decrease temperature studies of the charge transfer process methods: H2-deposition and BET measurements.
The results obtained show that the major effect of temperature reduction is a decrease in transportarea determinations were made by two different O(2-) in the diffusion region. Real surface The electrochemical investigation included controlled currents.

### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

BATTELLE COLUMBUS LABS OHIO 10/3 AD- 749 129

Failure Mechanisms and Accelerated Life Tests of Nickel-Cadmium Batteries.

3

DESCRIPTIVE NOTE: Final rept. 1 May 69-30 Jun 72, Aug 72 76P McCallum,J.;Miller,G.

CONTRACT: F33615-69-C-1537

MONITOR: AFAPL PROJ: AF-3145 TASK: 314522

TR-70-44-Pt-3

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Part 2, AD-730 345.
DESCRIPTORS: (\*PRIMARY BATTERIES,
RELIABILITY(ELECTRONICS)), (\*ALKALINE BATTERIES,
RELIABILITY(ELECTRONICS)), ACCELERATED TESTING, NICKEL,
CADMIUM, FAILURE(ELECTRONICS), THERMAL, SPACECRAFT
COMPONENTS, LIFE EXPECTANCY, THERMAL PROPERTIES
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

33

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€ Preliminary experiments indicated valid tests were developed with temperature gradients and/or with rates of discharge as the primary variables for accelerated life testing of sealed nickel-cadmium batteries. Depth of discharge was indicated to have only a very small effect on the life of cadmium electrodes. New sealed cells having longer life without, significant loss of performance, were designed and constructed. Verification tests were recommended for them. (Author)

AD- 749 129

ZOM02

AD- 749 270

PAGE

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### AD- 749 009

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

NAVAL ORDNANCE LAB WHITE OAK MD AD- 749 009

Lithium as an Anode in Concentrated Aqueous Lithium Chloride Solutions: a Feasibility Study.

3

Ambrus, Judith H. ; Gubner, DESCRIPTIVE NOTE: Final rept., 24P

NOLTR-72-138 REPT. NO.

PROJ: A310-310C/WR0-401-002

# UNCLASSIFIED REPORT

3 ESCRIPTORS: (\*LITHIUM, \*ELECTROCHEMISTRY), (\*ANODES(ELECTROLYTIC CELL), LITHIUM), ELECTROLYTES, LITHIUM COMPOUNDS, CHLORIDES, LOW TEMPERATURE

3 IDENTIFIERS: \*LITHIUM CELLS, BATTERY ELECTROLYTES, HIGH ENERGY BATTERIES

The anodic efficiency increases sharply with increasing concentration. Small increases in the anodic efficiency can be seen with increasing current densities and decreasing temperatures. The voltage high energy density, low temperature reserve battery. indicating that only small polarization effects are of the system is close to the theoretical voltage present. The study has demonstrated that the system would be feasible for the development of a LiC1(aq)/AgC1 system was measured as a function of electrolyte concentration (at 5.042, 10.05, and 13.82 m) temperature (-15, -25, and -35C) and current density (5 to 35 ma/sq cm). The anodic efficiency of lithium in the Li/

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

I- 748 896 10/3 ENERGY RESEARCH CORP BETHEL CONN AD- 748 896

Sealed Nickel-Zinc Rechargeable Batteries.

3

DESCRIPTIVE NOTE: Final rept. 31 Mar 71-30 Mar 72, Charkey, Allen ; 39P

CONTRACT: DAABO7-71-C-0134 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302

ECOM 0134-F MONITOR:

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also report dated Dec 71, AD-

3 DESCRIPTORS: (\*STORAGE BATTERIES, ZINC), NICKEL, DESIGN, BATTERY SEPARATORS, ELECTRODES, PLASTIC COATINGS, HALDCARBON PLASTICS, RELIABILITY(ELECTRONICS), ALKALINE BATTERIES, HYDROXIDES, BINDERS, TEST METHODS (IDENTIFIERS: \*ZINC CELLS, \*NICKEL ZINC CELLS, \*HIGH ENERGY BATTERIES, TETRAFLUOROETHYLENE RESINS (

3

Improved thorganic separators (ERC-2001) are discussed which contain a metallic layer hydroxide in These separators are ultra-thin, can easily be folded, and maintain their physical integrity during Cycling. The rate of oxygen recombination in sealed Data are presented which show that high energy sealed nickel-zinc cells are at present capable of over 300 maintenance free cycles at 62% depth of cells has been improved through the use of silvermercury recombination electrodes. Dissection of a representative cell with 2001 separators after 315 discharge. Energy densities range from 25 - 30 Wh/1b at rates of discharge of 3C to C/4. Combination with 20% by weight Teflon binder.

3

cycles showed that no zinc was present in the separators, negative electrode shape change was 32% and the positive electrodes had increased an average

in thickness.

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT AD- 748 454

Sealed Nickel-Cadmium Battery Assembly BB-553()/n.

3

Harsch, William C. : Gordon, DESCRIPTIVE NOTE: Final rept. Jan 70-Apr 72, 72 88P Dale V.

CONTRACT: DAAB07-70-C-0168 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302 MONITOR: ECOM 0168F

# UNCLASSIFIED REPORT

33 RELIABILITY(ELECTRONICS)), NICKEL, CADMIUM, TEST METHODS, DESIGN IDENTIFIERS: \*NICKEL CADMIUM BATTERIES DESCRIPTORS: (\*STORAGE BATTERIES,

The BB-553()/U nickel-cadmium storage battery assembly was developed to provide a portable D.C. power supply for use with electronically controlled hermetically-sealed, sintered plate nickel-cadmium storage battery. The battery assembly has a individual, series-connected cells provided with a man-pack equipment. The report contains the test results and a brief design description. The BB-553()/U battery assembly is a rechargeable, military-ruggedized design and consists of 20 pressure sensing charge control circuit.

### UNCLASSIFIED

DUC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MO7

Rate of Discharge of Accelerated Life Tests BATTELLE COLUMBUS LABS OHIO AD- 748 253

AUG 72 50P McCallum,John ;Roeger,Earl CONTRACT: F33615-69-C-1537

3

MONITOR: AFAPL

TR-72-67

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-748 252.
DESCRIPTORS: (\*STORAGE BATTERIES, ACCELERATED TESTING),
(\*SPACECRAFT COMPONENTS, STORAGE BATTERIES), TEST
METHODS, NICKEL, CADMIUM, STRESSES,
RELIABILITY(ELECTRONICS), ALKALINE BATTERIES
IDENTIFIERS: LIFE TESTS, \*NICKEL CADMIUM

3 3

all known variables were held constant. Both groups of cells degraded at a higher rate in measured demountable cells. Separate groups were discharged at C/2, C, 2C, 4C, and 8C rates. One experiment maintained uniform temperatures of about qualities at higher rates of discharge. Results are Special demountable cells were designed, constructed, and tested with rates of discharge as the primary independent variable. Duplicate +25C in all cells. The other experiment had an environmental temperature of +25C, but internal experiments were performed with groups of five heaters were maintained at +40C. Otherwise, discussed.

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UNCLASSIFIED

180 PAGE

AD- 748 253

AD- 748 454

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#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

22/2 BATTELLE COLUMBUS LABS OHIO 10/3 AD- 748 252

Temperature and Temperature Gradients for Accelerated Life Tests of Nickel-Cadmium

3

DESCRIPTIVE NOTE: Technical rept.,
AUG 72 82P Brooman, E. W. ; McCallum,
J. ; Roeger, E. A. , Jr.; Miller, G. H. ;
CONTRACT: F33615-69-C-1537

PROJ: AF-3145

TASK: 314522

TR-72-66 MONITOR: AFAPL

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE BATTERIES, ACCELERATED TESTING), (\*SPACECRAFT COMPONENTS, STORAGE BATTERIES), TEST METHODS, TEMPERATURE, NICKEL, CADMIUM, RELIABILITY(ELECTRONICS), ALKALINE BATTERIES (U) IDENTIFIERS: LIFE TESTS, \*NICKEL CADMIUM SUPPLEMENTARY NOTE: See also AD-748 253.

3

3 were designed and constructed for use in preliminary assessment of newly proposed accelerated life tests. Cycling tests were performed on groups of five cells each at ambient temperatures of -20, -5, 10, 25, and 40 C, and both with and without temperature gradients. The special demountable cells with internal heaters were used to provide an internal New test equipment and special demountable cells cell temperature of 40 C for those cells with temperature gradients. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

22/2 BATTELLE COLUMBUS LABS OHIO 10/3

Simulated Orbital Life Tests for Spacecraft Cells. Part II. Automatically Acquired Data, Review, and Recommendations.

3

AUG 72 33P Roeger, Earl A. ; Thomas, Ralph E. ; McCallum, John ; Waite, John H. ; Miller, Gerald H.; CONTRACT: AF 33(615)-3701, F33615-69-C-1537 PROJ: AF-3145 TASK: 314522 DESCRIPTIVE NOTE: Special technical rept.,

# UNCLASSIFIED REPORT

TR-71-74-Pt-2

MONITOR: AFAPL

SUPPLEMENTARY NOTE: Prepared in Cooperation with Cryptanalytic Computer Sciences, Inc., Cherry Hill, N. J. See also AD-736 471.

DESCRIPTORS: (\*STORAGE BATTERIES, FELIABILITY(ELECTRONICS)), (\*SPACECRAFT COMPONENTS, STORAGE BATTERIES), TEST METHODS, DATA PROCESSING, CORRELATION TECHNIQUES, ALKALINE BATTERIES. NICKEL, CADMIUM, SPACE ENVIRONMENTS BATTERIES

3 3

Content, availability, and recommended procedures for analysis of the data automatically acquired during 4-1/2 years of simulated orbital life testing of nickel cadmium spacecraft cells are described.

A sample of the approximately 1,000,000 records that are stored on magnetic tape is included and summary tables list documented conditions that may have yielded discontinuities, irregularities, or biases in the record data. Recommendations for data analysis by empirical, statistical, and physical methods are provided. The empirical method attempts to identify all possible indicators associated with failed cells. The physical methods examine the data, or its form for regular and inregular trends, relationships and underlying physical concepts. and explain these trends by cause and effect

DDC REPORT BIBLIDGRAPHY DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 746 549 10/2 10/3
ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE
VA

Small-Sized Sources of Current,

3

APR 72 193P Orlov,V. A.; REPT. NO. FSTC-HT-23-228-72 PROJ: FSTC-T7023012301

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of mono. Malogabarithye Istochniki Toka. Moscow. 1970 224p.

DESCRIPTORS: (\*BATTERY COMPONENTS, \*REVIEWS), ALKALINE BATTERIES, PRIMARY BATTERIES, STORAGE BATTERIES, FUEL CELLS, THERMOELECTRICITY, PHOTOELECTRIC CELLS (SEMICONDUCTOR), FERROELECTRICITY, BATTERY CHARGERS, MAINTENANCE, ELECTROLYTES, SILVER, ZINC, CADMIUM, NICKEL, MANGANESE, MERCURY, SEMICONDUCTORS, RADIOISOTOPE BATTERIES, USSR, (U)USSR RADIOISOTOPE BATTERIES, USSR, (U)USSR RADIOISOTOPE BATTERIES, USSR, (U)USSR CELLS, NICKEL ZINC CELLS, NICKEL CADMIUM BATTERIES, NICKEL CINC CELLS, BATTERY ELECTROLYTES, BIOLOGICAL FUEL CELLS, CADMIUM CELLS, SILVER ZINC BATTERY CELLS, SILVER CADMIUM CELLS, THERMOPHOTOVOLTAIC CONVERTERS, (U)

The book describes transformers of various types of energy into electric energy. Principles of action, mechanism, technical and operational characteristics of modern sources of current, i.e. chemical, semiconductor, atomic and others are presented. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 746 335
10/3
GENERAL ELECTRIC CO GAINESVILLE FLA BATTERY PRODUCT
SECTION

Nickel Hydroxide Battery Electrode Development.

3

DESCRIPTIVE NOTE: Final technical rept. 1 Jan 71-31 Jan 72,

JUL 72 237P Kroger, Hanns H.; REPT. NO. 72-BPS-02 CONTRACT: F33615-69-C-1312 PROJ: AF-3141 MONITOR: AFAPL TR-72-35

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*ELECTRODES, \*NICKEL),
(\*ELECTRODEPOSITION, NICKEL), (\*ALKALINE BATTERIES,
ELECTRODES), HYDROXIDES, NICKEL COMPOUNDS,
RELIABILITY(ELECTRONICS), TEST METHODS, PRODUCTION
IDENTIFIERS: \*NICKEL HYDROXIDE ELECTRODES, \*BATTERY
ELECTRODES

The report terminates the work on a three-year program aimed at the development of an improved nickel h droxide electrode for the use in rechargeable alkaline batteries for aerospace applications. The improvements sought were primarily concerned with achieving a better nickel electrode performance with respect to energy density, charge efficiency, and capacity reproducibility. The problems and improvements are discussed. An electrodeposition process was developed.

3

PAGE

AD- 746 335

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

RAI RESEARCH CORP HAUPPAUGE N Y 11/9 10/3 AD- 745 571

Manufacturing Methods for High Performance Grafted-Polyethylene Battery Separators.

3

DESCRIPTIVE NOTE: Final rept. 1 Dec 70-30 Jan 72, MAY 72, 291P D'Agostino, Vincent; Lee, Joseph ; RAI-429 CONTRACT: F33615-70-C-1193 PROJ: AF-396-0, AF-360-7 MAY 72 291P

# UNCLASSIFIED REPORT

TR-72-13

MONITOR: AFML

3 3 DESCRIPTORS: (\*BATTERY SEPARATORS, MANUFACTURING),
(\*ALKALINE BATTERIES, BATTERY SEPARATORS),
(\*POLYETHYLENE PLASTICS, BATTERY SEPARATORS),
(\*FLMS, CROSSLINKING(CHEMISTRY), RADIATION CHEMISTRY,
ACRYLIC RESINS, QUALITY OF TONTROL, SPECIFICATIONS,
CHEMICAL PROPERTIES, COSTS ESTIMATE
IDENTIFIERS: POLYMERIC FILMS, PROCESS CONTROL,
RADIATION POLYMERIC FILMS, PROCESS CONTROL,
RADIATION FOLYMERIZATION, GRAFT POLYMERIZATION, GRAFT POLYMERS, COST ESTIMATES

3 aircraft batteries and thus accomplish meaningful cost savings. Technology was developed to permit design of equipment for large scale production of the separator material. Prototype or pilot equipment of directed toward the generation of methacrylic acidalkaline battery separator material. This material significantly increasing the life and performance secondary nickel-cadmium and silver-zinc alkaline The development of new and improved manufacturing grafted- polyethylene film for use as a superior crosslinking, grafting, washing, converting and methods, controls, equipment and processes was for each phase was constructed and operated to packaging were established. (Author, modifiedis of interest to the Air Force as a means of establish optimum operating conditions and to determine process controls. Limitations on processing steps such as, film extrusion,

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO 10/3

Metal Bases of Alkaline Battery Electrodes, High Temperature Impregnation of Sintered

 $\Xi$ 

Petvushin, Yu. N.; REPT. NO. FTD-HC-23-1813-71 Skalozubov, M. F. ;

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*ELECTRODES, IMPREGNATION), (\*BATTERY COMPONENTS, ELECTRODES), ALKALINE BATTERIES, CADMIUM SUPPLEMENTARY NOTE: Unedited rough draft trans, of Issledovaniya v Oblasti Prikladnoi Elektrokhimii IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, BATTERY NICKEL, SINTERING, SOLUTIONS (MIXTURES), USSR, (USSR) v190 p96-100 1969.

ELECTRODES, TRANSLATIONS

3

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3 highly concentrated given solutions for the purpose of intensifying the process of filling the pores with an active mass. (Author) The proposed method of high temperature impregnation of sintered metal bases under excessive temperature impregnation of sintered metal bases in impregnation in highly concentrated solutions. The steam pressure eliminates the negative factors of authors investigate the possibility of using high

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 743 214 10/3 YARDNEY ELECTRIC CORP PAWCATUCK CONN Development of Battery, BA 536( )/U 150 AMP Hour (Advanced Development Engineering Design Type).

DESCRIPTIVE NOTE: rinal rept.,

MAR 72 53P Seidman, Sandy

CONTRACT: DAAB07-70-C-0019

PROJ: DA-1-G-663702-DG-10

TASK: 1-G-663702-DG-10

MONITOR: ECOM 0019-F

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*SIGNAGE BATTERIES. ZINC), AIR, DESIGN, CATHODES(ELECTROLYTIC CELL), PRODUCTION, ANODES(ELECTROLYTIC CELL), SIGNRAGE, RELIABILITY(ELECTRONICS), WATER ACTIVATED BATTERIES (U) IDENTIFIERS: \*ZINC AIR BATTERY CELLS, \*METAL AIR (U) BATTERIES, ENGINEERING DRAWINGS (U)

The report describes the design, development, fabrication, and delivery of Battery BA-536()/U 150 Ampere Hour. This is a six volt, 150 ampere hour mechanically rechargeable zinc air battery. The battery makes use of the bicell (dual cathode) system and is designed to be recharged' by replacement of spent anodes with fresh anodes and addition of water. The first group of batteries were rejected because of observed performance deficiencies. Changes, coupled with backup data, are discussed. (Author) (U)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 743 017 10/3

BATTELLE COLUMBUS LABS OHIO

Depths of Discharge for Accelerated Life

Tests of Cadmium Electrodes.

DESCRIPTIVE NOTE: Special technical rept.,

MAY 72 51P Reed, Allan H. ;McCallum,

3

3

John ; F33615-69-C-1537 PROJ: AF-3145

PROJ: AF-3145 TASK: 314522 MONITOR: AFAPL

# UNCLASSIFIED REPORT

TR-72-20

DESCRIPTORS: (\*CADMIUM, \*ELECTRODES), (\*STORAGE BATTERIES, CADMIUM), LIFE EXPECTANCY, ACCELERATED TESTING, CHEMICAL ANALYSIS, MICROSTRUCTURE IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

33

Physical and chemical changes that occur in cadmium electrodes have been studied as a function of their depth of discharge and number of cycles. The electrodes were examined after removal from cycling by metallographic techniques, by chemical analysis for cadmium and cadmium hydroxide, and by measurements of electrochemical capacity after cycling. The results show that greater losses of capacity occur at greater depths of discharge and after greater number of cycles. The losses of capacity appear to be related to structural changes in the cadmium deposits in the porous electrode. The results of the chemical analyses show that essentially all of the chemical analyses show that essentially all of the cadmium remains within the numbers of cycles. (Author)

PAGE

AD- 743 017

UNCLASSIFIED

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

Ekspluatatsionnykh Kharakteristik Serebryano-Characteristics of Silver-Zinc Storage Batteries (Ob Uluchshenii Nekotorykh Improvement of Certain Operational sinkovykh Akkumulyatorov),

Romanov, V. V. ; . FSTC-HT-23-1563-71 REPT. NO. FSTC-HT-23-1 PROJ: FSTC-T7023012301 10P JAN 72

# UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Trans. of Vestnik

Flektropromyshlennosti (USSR) v31 n9 p26-29 1966.

DESCRIPTORS: (\*BATTERY CHARGERS, ALTERNATING CURRENT),
STORAGE BATTERIES, SILVER, ZINC, ELECTROCHEMISTRY,
DIFFUSION, SURFACES, ELECTRODES, USSR
TRANSLATIONS

(U

3 possibilities for improvement of certain operational characteristics of silver-zinc batteries by charging these batteries with asymmetrical commercial Results are presented of an investigation of the frequency alternating current. (Author)

### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

WHITELEY INDUSTRIES INC WILMINGTON MASS AD- 742 732

Fuel Cell Electrodes for Hydrogen-Air Fuel Cell Assemblies

3

Final rept. Feb 70-Oct 71, Salathe, R. E.; MAY 72 59P Sa CONTRACT: DAAB07-70-C-0127 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302 MONITOR: ECOM 0127-F DESCRIPTIVE NOTE:

3

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*FUEL CELLS, RELIABILITY(ELECTRONICS)),
DESIGN, PORTABLE EQUIPMENT, HYDROGEN, AIR, GAS
GENERATING SYSTEMS, HYDRIDES, STORAGE BATTERIES,
ELECTRODES, ALKALINE BATTERIES
IDENTIFIERS: FUEL CELL BATTERY HYBRID SYSTEMS,
\*HYDROGEN AIR FUEL CELLS

delivering in excess of 60 watts at a nominal output hydrogen-air fuel cell module for use in a portable hydrid fuel cell-battery system. The fuel cell module consists of a stack of 20 single assemblies. Each assimbly contains 2 electrically independent cells with a common electrolyte compartment. When of 15 volts. Dry weight of the module assembly is 4.2 pounds. Electrolyte reservoir capacity is 250 cc, utilizing 3 to 6 molar potassium hydroxide. The report describes the design and evaluation of Supplied with hydrogen, as generated from Sodium Aluminum Hydroxide, the module is capable of

3

(Author)

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

7/4 TYCO LABS INC WALTHAM MASS 10/3 AD- 742 720

3 Low Temperature Electrochemical System

DESCRIPTIVE NOTE: Semiannual technical rept. no. 1, Malachesky, Paul A.; Cahill, Jul-31 Dec 71, Kathleen

REPT. NO. C-153 CONTRACT: DAAB07-71-C-0291 PROJ: PRON-C8-1-04407-01-68-CA MONITOR: ECOM 0291-1

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*LOW TEMPERATURE BATTERIES, ZINC), (\*CATHODES(ELECTROLYTIC CELL), \*ZINC), ELECTROCHEMISTRY, AIR, TRANSPORT PROPERTIES, POLARIZATION, OXYGEN, REDUCTION(CHEMISTRY), ALKALINE BATTERIES IDENTIFIERS: \*ZINC AIR BATTERY CELLS, \*METAL AIR

black electrode structure, the pertinent parameters which describe the temperature dependence of the electrochemical and transport processes have been determined in 31% KOW electrolyte. The temperature could lead to problems in low temperature operation of zinc-air cells. Comparisons of the low temperature operation of different air electrode materials have revealed a distinct dependence of the transport-limited current on electrode structure, electrodes in metal-air batteries (such as zincindicating a possible approach to improved low temperature operation of air electrodes Via air). Using a typical Teflon-bonded platinum Studies have been carried out on the factors influencing low temperature operation of air modifications in air electrode structure.

3

### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

- 742 670 14/2 10/3 ARMY MISSILE COMMAND REDSTONE ARSENAL ALA AD- 742 670

System for Measurement of Response Time of High Current Interruption Components,

3

Straits, Ray; 136 JUL 71

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*TEST EQUIPMENT, ELECTRIC CURRENTS), (\*STORAGE BATTERIES, TEST EQUIPMENT), POWER SUPPLIES, CIRCUIT BREAKERS, SUPPRESSORS, CURRENT LIMITERS, LEAD(METAL), ACIDS, TRANSIENTS
IDENTIFIERS: LEAD ACID BATTERIES

33

protective and control devices for the determination A method is discussed for providing a controllable high current source which is applied to circuit of their surge and/or maximum interrupt capability and response time. (Author)

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AD- 742 670

ZOMOZ

AD- 742 720

PAGE

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTESVILLE 13/6 10/3 AD- 742 012

Storage Batteries (Operation, Technical Servicing, and Repair).

3

REPT. NO. FSTC-HT-23-1048-71 PROJ: FSTC-T7023012301

# UNCLASSIFIED REPORT

i Remont), Moscow, 12 Mar 70 p1-196.
DESCRIPTORS: (\*STORAGE BATTERIES. \*HANDBOOKS),
(\*PASSENGER VEHICLES, STORAGE BAITERIES), MAINTENANCE,
DESIGN, VOLTAGE REGULATORS, REVIEWS, USSR
(IDENTIFIERS: TRANSLATIONS Batarei (Ekspluatätsiya, Teknicheskoi Obsluzhivanya, SUPPLEMENTARY NOTE: Trans. of mono. Akkumulyatorne

3 storage-battery departments in automotive enterprises departments of automotive enterprises and specialized servicing and repair of storage batteries, as well as the technology of their repair, are included. references, neguined by workers in automotive and auto-repair enterprises for the operation, workshops are given. Catalogs and descriptions of technical equipment required for the technical organizing the technical servicing and repair of Recommendations are made for the organization of maintenance, and repair of storage batteries are presented. Work flow-sheets for storage-battery The document presents the basic principles of storage batteries in automotive enterprises. and in specialized workshops. Guideline and

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

MALLORY BATTERY CO TARRYTOWN N 10/3 AD- 741 838

Low Temperature HgO-Zn Battery for Transceiver Applications.

3

DESCRIPTIVE NOTE: Final rept. 26 May 69-30 Nov 71, APR 72 86P Kelsey, Robert H.; Kang, H. Y.; Rao, M. L. B.; Fagan, F. G.; Hoffman, U. C.;

F33615-69-C-1832 MONITOR: AFAPL PROJ: AF-3145 TASK: 314522 CONTRACT:

# UNCLASSIFIED REPORT

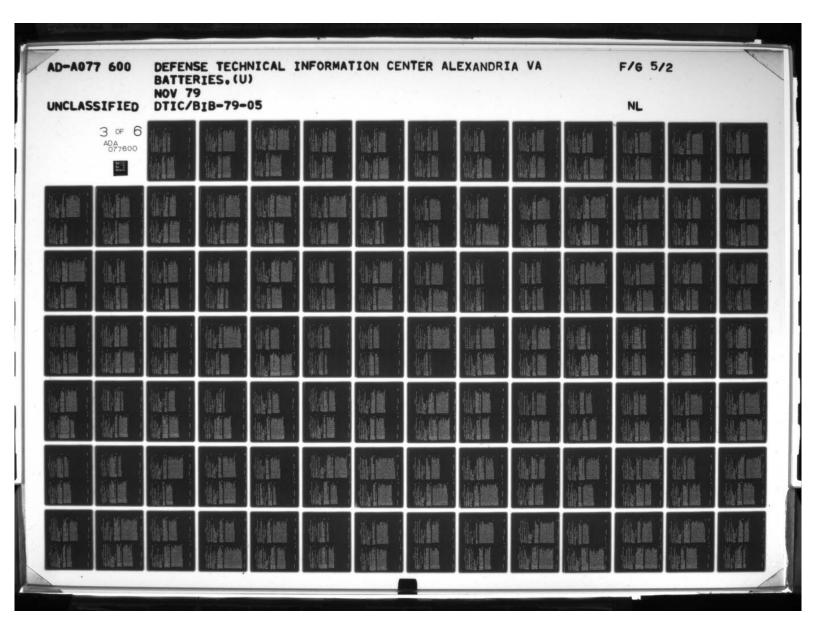
DESCRIPTORS: (\*PRIMARY BATTERIES, ZINC), AIR SEA RESCUES, TRANSMITTER RECEIVERS, MERCURY COMPOUNDS, OXIDES, DESIGN, RELIABILITY(ELECTRONICS), ALKALINE BATTERIES, ELECTROLYTES, BATTERY SEPARATORS IDENTIFIERS: ZINC CELLS, \*MERCURY ZINC CELLS

33

The report describes the work performed to improve fifteen, the final selection depending on material adaptation to cell configuration. The cells design and performance are examined. (Author) selected as an absorbent, and four acceptable separator materials were screened from a group of electrode surface area was thus developed. A non-woven mat of polyamide (nylon) fibers was the low temperature performance of zinc-mercuric oxide batteries for transceiver applications. Described is a cell employing two anode and depolarizer parts arranged as nested concentric annular cylinders with interposed separator and absorbent layers as prewound tubes. Maximum

3

AD- 741 838



SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

HARRY DIAMOND LABS WASHINGTON D C

Organic Electrolyte Battery Systems

3

Nelson, Jeffrey T. ; Green, REPT. NO. HDL-TR-1588 PROJ: DA-1-T-061102-A-34-A, HDL-9EC94 MONITOR: GIDEP 102.80.00.00-N3-01 MAR 72 108P Carla F.

# UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*PRIMARY BATTERIES, ELECTROLYTES), (\*FUZES(ORDNANCE), PRIMARY BATTERIES), LOW TEMPERATURE BATTERIES, TEMPERATURE, ORGANIC SOLVENTS, ELECTRODES, TABLES(DATA), MELTING POINT, REVIEWS (L ELECTROLYTES

3 found to be not specifically applicable, but useful only in a qualitative sense. A plan of study and a list of three anodes, eight solvents, seven solutes, and seven cathodes derived from these data are requirements necessary for such power supplies, were A search of the pertinant literature on organic electrolyte battery systems has been conducted to determine which systems, if any, might be useful to fuze power supplies. The data found in the literature, evaluated in the light of the presented. (Author)

### UNCLASSIFIED

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY ENGINEERING LAB AD- 741 704

Evaluation Program for Secondary Spacecraft Cells. Acceptance Tests of General Electric 4.5 Ampere-Hour Nickel-Cadmium Cells Nimbus Type,

3

MAR 72 12P REPT. NO. QEEL/C-72-128

### UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*STORAGE BATTERIES,
RELIABILITY(ELECTRONICS)), METEOROLOGICAL SATELLITES,
SPACECRAFT COMPONENTS, NICKEL, CADMIUM,
ACCEPTABILITY
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, NIMBUS

3 The report describes an Acceptance Test of 4.5 Ampere-Hour Nickel-Cadmium Secondary Spacecraft Cells, NIMBUS Type Manufactured by General Electric Company. (Author)

AD- 741 704

ZOMO2

AD- 741 786

188

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UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLICGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 741 342

Secondary Zinc-Air Cell Investigations.

3

Wagner, Otto C. Technical rept., APR 72 36F REPT. NO. ECOM-3556 DESCRIPTIVE NOTE:

DA-1-T-662705-A-053 1-T-662705-A-05302 PROJ: TASK:

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*SICRAGE BATTERIES, \*ZINC), AIR, DESIGN, DEGRADATION, ELECTRODES. SILVER ALLOYS, POLARIZATION, CORROSION, DENDRITIC STRUCTURE, MERCURY ALLOYS (LIDENTIFIERS: \*ZINC AIR BATTERY CELLS, \*METAL AIR BATTERIES, BATTERY ELECTRODES, HIGH ENERGY CELLS (L

3

3 study were: shoring by zinc penetration, loss of capacity by the zinc ahode due to edge-corrosion and surface densification, platinum poisoning of the zinc anode when employing platinum-catalyzed air-cathodes, Zinc-air cells have been developed that are capable of delivering over 50 cycles. These cells were constructed with silven-amalgam air-cathodes, nickel starvation. The means of overcoming these problems and wassivation of the zinc anode by electrolyte screen charging electrodes, and teflonated zinc are presented. (Author)

### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N AD- 741 340

Limiting Factors for Zinc-Air Batteries at Low and Elevated Temperatures.

3

Nordell, Carl A. ; DESCRIPTIVE NOTE: Technical rept., DA-1-T-662705-A-053 1-T-662705-A-05302 MAR 72 37P REPT. NG. ECOM-3553 PRGJ: DA-1 TASK:

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE BATTERIES, \*ZINC), AIR, PRIMARY BATTERIES, DESIGN, RELIABILITY(ELECTRONICS), ELECTROLYTES, HUMIDITY, POLARIZATION IDENTIFIERS: \*ZINC AIR BATTERY CELLS, \*METAL AIR BATTERIES, HIGH ENERGY BATTERIES

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over conventional primary and secondary batteries in terms of weight, power capability, and mechanical recharge for manpack electronic equipment.

However, serious problems exist in maintaining the inherently high energy density under intermittent discharge conditions at both low temperatures Zinc-air batteries offer significant advantages (below 32F) and elevated temperatures (up to 160F). The report covers an investigation of

these conditions and makes recommendations for design and operation to extend the performance capability. factors influencing and/or limiting the performance can be applied to the primary water activated zinccells, most of the conclusions and recommendations of mechanically rechargeable zinc-air cells under conducted on mechanically rechargeable zincrain While it is true that the tests reported were air cell as well. (Author)

3

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

ENERGY RESEARCH CORP BETHEL CONN

Secondary Zinc-Oxygen Batteries.

3

DESCRIPTIVE NOTE: Semi-annual rept., MAR 72 45P Klein, Martin; DAAB07-: 1-C-0249 ECOM 0249-1 CONTRACT:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, ZINC), DESIGN, OXYGEN, BATTERY SEPARATORS. HYDROXIDES, ELECTRODES, PLATINUM, TEST METHODS, PRODUCTION, PRESSURIZATION (U) 3 IDENTIFIERS: \*ZINC AIR BATTERY CELLS, \*METAL AIR BATTERIES, HIGH ENERGY BATTERIES

3 based on the concept of using single sealed cylindrical cells in which the active electrodes and stored oxygen are contained. The cylindrical cell container serves as the pressure vessel for the stored oxygen. The zinc electrode is sandwiched between two layers of inorganic separator material electrodes have been cycled up to 200 times. A design analysis of a 25AH cell based on the experimental results show that single cells will be capable of 60WH/lb and 2.7WH/cu in at 750 psi gas bifunctional oxygen electrode that is used in both the charge and discharge mode. Individual test discussed secondary zinc-oxygen battery is Investigations have centered on the use of a containing electrolyte bound in the pores. storage. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AMERICAN UNIV WASHINGTON D C AD- 740 210

Research on Electrochemical Energy Conversion Systems.

3

Daryl H. ;Thompson, Charles D. ;
CONTRACT: DA-44-009-AMC-1386(T)
PROJ: DA-11-061102-A-34-A DESCRIPTIVE NOTE: Rept. no. 12 (Final),

TASK: 1-T-061102-A-34-A-00

# UNCLASSIFIED REPORT

(\*FURDXANES, \*REDUCTION(CHEMISTRY)), (\*ELECTRODES, \*OXYGEN), (\*ELECTRIC MOTORS, ENERGY CONVERSION), LITHIUM, ELECTROLYTES, POLARDGRAPHIC ANALYSIS, SOLUBILITY, AIR, MATHEMATICAL ANALYSIS, (U)MATHEMATICAL SUPPLEMENTARY NOTE: See also Semi-annual rept. no. 10, (\*BATTERY COMPONENTS, \*ELECTROCHEMISTRY), DESCRIPTORS: AD-729 923. ANALYSIS

3 IDENTIFIERS: \*LITHIUM CELLS, ORGANIC BATTERIES, \*BATTERY DEPOLARIZERS, BENZOFUROXAN, \*HIGH ENERGY CELLS, DISSOLVED GASES, ELECTRIC VEHICLES

3 galvanic cells, the mathematical analysis of electrochemical energy conversion processes, and exploratory research. The investigation of high energy galvanic cells has dealt with two problems; the first, the electroreduction of benzofuroxan in crganic electrolytes and, the second, the feasibility of the air electrode in organic systems. In connection with the feasibility study of the air electrode the solubility of oxygen was measured in systems has involved work on three tasks; high energy acceleration profiles applicable to military vehicle four organic solvents and two organic electrolytes. propulsion. Exploratory research dealt with solid The research on electrochemical enargy conversion systems dealt with the development of velocity-The mathematical analysis of energy conversion Proton conductors. (Author)

AD- 740 210

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 740 105 10/3 22/2
NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB

Evaluation Program for Secondary Spacecraft Cells. Acceptance Tests of Eagle-Picher 20.0 Ampere-Hour Nickel-Cadmium Cells with Auxiliary Electrodes,

3

MAR 72 21P Christy,D. E. REPT. NO. QEEL/C-72-127

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STOPAGE BATTERIES, RELIABILITY(ELECTRONICS)), (\*SPACECRAFT COMPONENTS, STORAGE BATTERIES). TEST METHODS, NICKEL, CADMIUM (1) IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

The purpose of the test program was to insure that all cells put into the life cycle program are of high quality by the removal of cells found to have electrolyte leakage, internal shorts, low capacity, or inability of any cell to recover its open circuit voltage above 1.150 voits on the cell short test.

Twenty-nine 20.0 ampere-hour nickel-cadmium spacecraft cells with auxiliary electrodes purchased from Eagle-picher Company, Joplin, Missouri (U)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 740 061 10/3 22/2
NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB

Evaluation Program for Secondary Spacecraft Cells. Acceptance Test of Eagle-Picher 100 Ampere-Hour Nickel-Cadmium Cells with Auxiliary Electrodes.

3

MAR 72 15P Christy, D. E. REPT. NO. QEEL/C-72-126

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center. DESCRIPTORS: (\*STORAGE BATTERIES.\* RELIABILITY(ELECTRONICS)), (\*SPACECRAFT COMPONENTS, STORAGE BATTERIES), TEST METHODS, NICKEL, CADMIUM BATTERIES

33

The purpose of the acceptance test program is to insure that all cells put into the life cycle program are of high quality by the removal of cells found to have electrolyte leakage, internal shorts, low capacity, or inability of any cell to recover its open circuit voltage above 1.150 volts after the cell short tests. Five 100 amphere-hour nickel-cadmium spacecraft cells were tested from Eage-Picher Company, Joplin, Missouri. The cells were rated at 100 ampere-hours and equipped with auxiliary (U)

AD- 740 105

AD- 740 061

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 740 060 10/3 22/2 NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB

Evaluation Program for Secondary Spacecraft Cells Evaluation of Storage Methods, Open Circuit Versus Continuous Trickle Charge, Sonotone 3.5 Ampere-Hour Sealed Nickel-Cadmium Secondary Spacecraft Cells,

FEB 72 31P Thomas, R. E. ; PT. NO. GEEL/C-72-31

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center. DESCRIPTORS: (\*STORAGE BATTERIES, RELIABILITY(ELECTRONICS)), (\*SPACECRAFT COMPONENTS, STORAGE BATTERIES), TEST METHODS, NICKEL, CADMIUM (U) IDENTIFIERS: \*NICKEL CADMIUM (U)

Evaluation of methods for storage of nickel-cadmium cells at room ambient conditions was begun. The nickel-cadmium cells used for this test were 3.5 ampere-hour 'D' cells manufactured by the Sonotone Corporation. The overall object of these evaluation programs is to gather specific information concerning secondary spacecraft cells. Information concerning performance characteristics and limitations including cycle life under various electrical and environmental conditions will be of interest to power systems designers and users.

Cell weaknesses, including causes of failure of designs, will be of interest to suppliers as a guide to product improvement. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MO7

AD- 739 997 10/3 YARDNEY ELECTRIC CORP PAWCATUCK CONN

Water Activated Zinc-Air Standard Line

Battery BA-535 ( )/U.

3

DESCRIPTIVE NOTE: Final rept. Jan 69-Nov 71, FEB 72 28P Skelton, James ; CONTRACT: DAAB07-69-C-0146 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-05302 MONITOR: ECOM 0146-F

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*WATER ACTIVATED BATTERIES, DESIGN), ZINC,
AIR, RELIABILITY(ELECTRONICS), ELECTRODES, TEST
METHODS
IDENTIFIERS: \*ZINC AIR BATTERY CELLS, \*METAL AIR
BATTERIES, \*RESERVE BATTERIES
(U)

The report describes the work performed to design and fabricate twenty five (25) BA-535

Exploratory Development batteries in accordance with the technical guidelines for a six pound water activated Zinc/Air battery. The batteries were tested at 0f, 20f, room temperature, and 125f. In addition, batteries were discharged following 7-addy activated stand at room temperature and 100 hour activated stand at 125f. The report discusses design, fabrication, results and conclusions. (U)

PAGE

UNCLASSIFIED

AD- 739 997

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB AD- 739 740

Evaluation Program for Secondary Spacecraft Cells. Acceptance Tests of Heliotek Division, Textron, Inc. 20.0 Ampere-Hour Nickel-Cadmium Cr.1s,

Christy, D. E. REPT. NO. QEEL/C-72-101 PROJ: NASA-S-23404-G 23P MAR 72

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE BATTERIES, RELIABILITY(ELECTRONICS)), SPACECRAFT COMPONENTS, TEST METHODS, ACCEPTABILITY
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES
(L

3 have electrolyte leakage, internal shorts, low capacity, or inability of any cell to recover its open circuit voltage above 1.150 volts after the cell short test. Ten nickel cadmium cells were The purpose of the acceptance test program was to insure that all cells put into a life cycle program are of high quality by the removal of cells found to purchased from Heliotek, Inc., Sylmar, California. The cells were rated at 20.0 amperehours. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N AD- 739 490

Engineering Evaluation of Non-Reserve Zinc-Air Cells.

3

DESCRIPTIVE NOTE: Research and technical rept., Rinaldi, Rose ; JAN 72 28P R. REPT. NO. ECOM-3528 PROJ: DA-1-T-662705-A-053

3

1-T-662705-A-05302

TASK:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, RELIABILITY(ELECTRONICS)), FEASIBILITY STUDIES, POWER SUPPLIES, PORTABLE EQUIPMENT, RADIO EQUIPMENT, RADAR EQUIPMENT IDENTIFIERS: \*ZINC AIR BATTERY CELLS, \*METAL AIR BATTERIES, EVALUATION

3 3

> ECOM on AA size primary, non-reserve zinc-air cells, procured from Leesona Moos Laboratories, Great Neck, New York. The cells were evaluated under a variety of rate and temperature conditions to determine feasibility of the system to at An engineering evaluation program was conducted meet representative manpack communications requirements. (Author)

3

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N 10/3 AD- 739 488

Investigations on Onganic Electrolyte Lithium-C(X)F Cells.

DESCRIPTIVE NOTE: Research and development technical

Almerini, Achille L. FEB 72 20P REPT. NO. ECOM-3531 rept

DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302

PROJ:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, \*LITHIUM),
ELECTROLYTES, GRAPHITE, FLUORIDES, CATHODES(ELECTROLYTIC
CELL), DESIGN, CARBONATES
IDENTIFIERS: \*LITHIUM CELLS, ORGANIC BATTERIES,
BATTERY ELECTROLYTES, PROPYLENE CARBONATES,
\*HIGH ENERGY CELLS, CYC.IC COMPOUNDS, CARBONATES,
ETHYLENE, FACTORIAL DESIGNS

3 present emphasizing optimization of cathodes are at present emphasizing optimization of cathode fabrication methods and choice of the preferred x level (degree of fluorination). The C(3.5)F level was shown in a fractional factorial design experiment to be significantly preferable to C(4.5)F to increase energy density. More highly fluorinated graphites were also procured (i.e., C2F and CF) and show promise of ultimately yielding cell outputs of well over 100 Wh/lb. Internal investigations on lithium organic

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

- 739 211 10/3 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO AD- 739 211

Sealed Cadmium-Nickel Batteries,

3

3

Wu, Shou-shung REPT. NO. FTD-HT-23-1570-71

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Edited trans. of Tien Shin Chieh (Mainland China) v17 n7 p271 1964, by Gilbert

DESCRÍPTORS: (\*STORAGE BATTERIES, REVIEWS), NICKEL, CADMIUM, DESIGN, PRODUCTION, CHINA IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, TRANSLATIONS

3 3

3 sealed type cadmium-nickel storage batteries, the author discusses its performance theory, construction and applications. A table is also given summarizing the models, weight and capacity of such batteries produced in France, Soviet Russia, West Germany and Belgium. (Author) After a brief description of the advantages of

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AD- 739 488

PAGE

UNCLASSIFIED AD- 739 211

ZOMO2

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

- 738 880 10/3 22/2 NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB AD- 738 880

Evaluation Program for Secondary Spacecraft

3

DESCRIPTIVE NOTE: Annual rept. no. 8, FEB 72 289P Christy, D. E.; 72 289P QEEL/C-72-1 NASA-PO-W12397 REPT. NO.

UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Report on Cycle Life Test.
See also Annual rept. no. 7, Ab-718 854.
DESCRIPTORS: (\*STORAGE BATTERIES,
STORAGE BATTERIES). (\*SPACECRAFT COMPONENTS,
STORAGE BATTERIES). ENVIRONMENTAL TESTS, TEST METHODS,
CADMIUM, NICKEL, SILVER, ZINC
IDENTIFIERS: ZINC CELLS, LIFE TESTS, \*NICKEL CADMIUM
BATTERIES, CADMIUM CELLS. \*SILVER CADMIUM CELLS,
\*SILVER ZINC BATTERY CELLS

3

3 each type (usually five) are subjected to the general performance tests to determine the limit of their actual capabilities. The types of cells tested were nickel-cadmium, silver-cadmium, and that all cells put into the life cycle program meet The report covers the cycle life test of the evaluation program of secondary spacecraft cells. The purpose of the acceptance tests is to insure purchase contracts. A sample number of cells of the specifications outlined in the respective silver-zinc cells. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 737 519 10/3 BATTELLE COLUMBUS LABS OHIO

The Thermal Conductivity of Sealed Nickel-Cadmium Cells.

3

Brooman, Eric W. ; McCallum, DESCRIPTIVE NOTE: Technical rept., FEB

John ; CONTRACT: F33615-69-C-1537 PROJ: AF-3145 TASK: 314522

TR-71-75 MONITOR: AFAPL UNCLASSIFIED REPORT

CONDUCTIVITY), CONFIGURATION, NICKEL, CADMIUM, PREDICTIONS, BATTERY SEPARATORS, TEMPERATURE, (U)TEMPERATURE
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES DESCRIPTORS: (\*BATTERY COMPONENTS, THERMAL

33

ampere-hour nickel-cadmium aerospace cells, as given by the ratio of conductivities in the parallel and perpendicular directions, varies according to cell type, and values in the range 1.76 through 2.63 were the sizes, arrangements, and the composition of the batteries can be predicted on the basis of knowing The objective of the research task is to show that thermal resistances or conductivities of cells or cell or battery components, and their thermal conductivities. The thermal anisotropy of 20-

3

obtained. (Author)

PAGE

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ZOMO2

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

GENERAL ELECTRIC CORPORATE RESEARCH AND DEVELOPMENT SCHENECTADY N Y

Mercuric Oxide-Cadmium Battery for Transceiver Applications.

3

DESCRIPTIVE NOTE: Technical rept. 1 Jul 69-30 Oct 71, JAN 72 134P Christopher, H. A. ;King, R. N. ; Moran, P. J. ; Fontanella, E. L. ; Faires,

CONTRACT: F33615-69-C-1831

PROJ: AF-3145 TASK: 314522

TR-71-99 MONITOR: AFAPL

# UNCLASSIFIED REPORT

3 3 ESCRIPTORS: (\*PRIMARY BATTERIES, DESIGN),
(\*TRANSMITTERS-RECEIVERS, PRIMARY BATTERIES),
MANUFACTURING, MERCURY COMPOUNDS, OXIDES, CADMIUM, COLD
WEATHER TESTS, ALKALINE BATTERIES, ELECTRODES, \*MERCURY CELLS, AN/URC-64, \*CADMIUM MERCURY CELLS ELECTROLYTES DESCRIPTORS:

systems, the identification of suitable cell case materials and methods for cell assembly, the development of an optimized overall cell design, and The work covered in this report was directed toward the design and fabrication of 200 prototype mercuric the mercuric oxide-zinc system presently employed in life-and low-temperature operating capability over corresponding techniques for producing the cell components required to meet the performance goals. spectrum of possible operating temperatures from -55C to +74C consisted of a 102-milliampere drain for one half-hour. The experimental program included efforts on th. development of improved oxide-cadmium batteries to provide enhanced shelf cubic inch and 19.2 watthours per pound. The specified load profile to be met over the entire temperature energy density of 1.95 watthours per electrode structures and separator-electrolyte the URC-64 transceiver radio. Emphasis in the design of this battery was aimed at a room-

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 736 471 10/3 22, BATTELLE COLUMBUS LABS OHIO

Simulated Orbital Life Tests for Spacecraft Cells. Part I. Procedures and Manually Acquired Data.

McCallum, John ; Miller, Gerald H.; CONTRACT: F33615-69-C-1537, AF 33(615)-3701 TASK: 3145 DESCRIPTIVE NOTE: Special technical rept.,

TR-71-74-Pt-1 MONITOR: AFAPL

### UNCLASSIFIED REPORT

RELIABILITY(ELECTRONICS)), (\*SPACECRAFT COMPONENTS, STORAGE BATTERIES, TEST METHODS, SPACE ENVIRONMENTS, NICKEL, CADMIUM IDENTIFIERS: \*NICKEL CADMIUM BATTERIES DESCRIPTORS: (\*STORAGE BATTERIES,

33

Conditioned for test groups, and summarizes all the manually acquired data. (Author) life tests, records how cells were selected and sealed nickel-cadmium cells is presented under conditions which simulate both sychronous (24 Orbital applications. The report describes the Information concerned with the life testing of hours) and polar (5.31 hours) spacecraft

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PAGE

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AD- 736 769

UNCLASSIFIED AD- 736 471

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7 74 736 460 7/4 10/3 CALVIN COLL GRAND RAPIDS MICH DEPT OF CHEMISTRY

Battery Zinc Electrode Kinetics

Investigation.

DESCRIPTIVE NOTE: Annual rept. no. 2, 15 Dec 70-15 Dec Dirkse, T. P. ;

DEC 71 35P Dir AF-3145

TR-71-96 AFAPL MONITOR:

# UNCLASSIFIED REPORT

33 ESCRIPTORS: (\*ZINC, \*ELECTROCHEMISTRY), (\*STORAGE BATTERIES, ZINC), ELECTRODES, REACTION KINETICS, ALKALINE BATTERIES, ELECTROLYTES, HYDROXIDES, CORROSION, LABELED SUBSTANCES \*BATTERY ELECTRODES DENTIFIERS: \*ZINC CELLS, \*BATTERY ELECTRODES DESCRIPTORS:

3 the form of dendrites which may form metallic bridges Batteries using a zinc anode and an alkaline electrolyte offer much promise in terms of desirable energy density factors. However, sometimes when double impulse, and potentiostatic methods were used electrode is charged, the zinc often deposits in between plates and lead to internal shorting of the measurements made in solutions of controlled ionic were measured over a temperature range of -33 to + concentration of unbound water in the electrolyte. A current inversion appears to be related to the kinetics of this problem, the exchange current densities of the zinc electrode in KOH solutions cell. In order to gain an understanding of the This matter is discussed in connection with 55C in 1 to 14 molar KOH. Galvanostatic,

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

)- 735 864 10/3 JOHNS HOPKINS UNIV SILVER SPRING MD APPLIED PHYSICS AD- 735 864

Seawater Battery Experiments.

3

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Wagner, J. P. DESCRIPTIVE NOTE: Technical memo., 75P

REPT. NO. APL-TG-1176 CONTRACT: N00017-72-C-4401

GIDEP

MONITOR:

### UNCLASSIFIED REPORT

347.60.00.00-56-02

DESCRIPTORS: (\*WATER-ACTIVATED BATTERIES, DESIGN), ELECTROCHEMISTRY, SEA WATER, CHLORINE, MAGNESIUM, ELECTROLYTES, RELIABILITY(ELECTRONICS)
IDENTIFIERS: MAGNESIUM CELLS, \*SEA WATER

3 3

BATTERIES

Results from an experimental study pertaining to

inductive viewpoint based on the Narnst equation and also from the theory of charge transport in ionic solutions. The feasibility of employing the chlorine seawater battery for underwater applications the development of a high energy density seawater battery are presented. In the initial phase of the study, cell orientation, cell geometry, electrode structure, and salinity effects were examined as to only a slight effect on increasing cell performance characteristics and the electromotive force. In the the porous cathodes was investigated. Nitrogen had Battery reaction mechanisms are discussed from an second phase, injection of nonreacting (nitrogen) and reacting (oxygen and chlorine) gases through their effects on the current versus time

is also discussed. (Author)

AD- 735 864

AD- 736 460

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

13/1 10/3 DAYTON UNIV OHIO AD- 735 736

An Experimental Investigation of Cooling a High Rate Nickel-Cadmium Battery with an Intercell Planar Heat Pipe. DESCRIPTIVE NOTE: Technical rept. Sep-Dec 70, SEP 71 30P Manefkey, Edward T. , Jr.;

CONTRACT: F33615-67-C-1027 Kreitman, Marshall;

PROJ: AF-3145

MONITOR: AFAPL

# UNCLASSIFIED REPORT

TR-71-40

3 DESCRIPTORS: (\*SIGRAGE BATTERIES, \*HEAT EXCHANGERS), TEMPERATURE CONTROL, NICKEL, CADMIUM, SPACECRAFT COMPONENTS, DESIGN, PERFORMANCE(ENGINEERING), HEAT DESCRIPTORS: TRANSFER

3 IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, \*HEAT

The purpose of the research was to investigate the

3 passive thermal control afforded a battery by the heat pipe. Heat pipes are being considered for thermal control of spacecraft batteries, both as intercell and as battery base plate-to-space radiator heat transfer devices. The report describes the use of a planar (rectangular cross section) stainless steel - water heat pipe as an intercell heat transfer compared to that of uncooled cells and cells cooled with a metallic aluminum intercell fin. device to cool high-rate nickel-cadmium battery performance of the heat-pipe-cooled cells was cells. Passive thermal control of battery (cell) temperature was demonstrated and

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

BATTELLE COLUMBUS LABS OHIO AD- 735 269

Lithium Battery Development.

Semones, Donald E. ; DESCRIPTIVE NOTE: Final rept., 65P

3

REPT. NO. BATT-8917-F CONTRACT: F33615-68-C-1282 McCallum, John ;

MONITOR: AFAPL PROJ: AF-3145 TASK: 314522

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), LITHIUM, THIOCYANATES, ELECTROLYTES, BATTERY SEPARATORS, CARBONATES, NICKEL COMPOUNDS, RELIABILITY(ELECTRONICS), DESCRIPTORS: ELECTRODES

IDENTIFIERS: \*LITHIUM CELLS, POLYPROPYLENE, PROPYLENE CARBONATES

electrolyte is a conductive propylene carbonate-thiocyanate salt which can be used in combination with metal thiocyanate positive electrodes. Nickel thiocyanate electrodes were fabricated: The best provide improved electrolytes and electrodes for rechargeable, nonaqueous lithium batteries. The The objective of the described research was to

previous cells, thin cells were also built that used cell performance showed a need for lowered weight of polypropylene separator film that showed promise for Studies on battery separator materials uncovered a use in the organic electrolytes. In an attempt to lower the weights of all components compared with electrolyte and electrode supporting structures. ultra-thin nickel screen electrode supports and Separators less than 1-mill thick.

3

AD- 735 736

AD- 735 269

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

Solar Charger Kit (Experimental).

3

DESCRIPTIVE NOTE: Research and development technical Seapker, H. B. ; Mount, J. 251 NOV 71 rept

DA-1-S-663719-DK-75 1-S-663719-DK-7501 NO. ECOM-3452 REPT. PROJ: TASK:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY CHARGERS, \*SOLAR CELLS),
MODIFICATION KITS, SILICON, RELIABILITY(ELECTRONICS),
LIFE EXPECTANCY, LASERS, RANGE FINDING
IDENTIFIERS: LASER RANGE FINDERS, NICKEL CADMIUM
BATTERIES, AN/GVQ-10, INTEGRATED OBSERVATION SYSTEM,
IOS(INTEGRATED OBSERVATION SYSTEM)

3 in any service wherever its output capacity is equal to the power demand. (Author) interdicted. The solar kit has broader application battery in service for the Integrated Observation System (IDS) AN/GVQ-10 when installed at remote observation post where no local power is The Solar Charger Kit was specifically developed to maintain the BB-501/U nickel-cadmium available and supply replacements are frequently

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

AD- 734 219

Manufacture and Use of Atomic Batteries,

3

Schaefer, H. REPT. NO. FTD-HT-23-973-71

# UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Edited trans. of Isotopenpraxis (East Germany) v6 n1 p1-11 1970, by J. Stock.
DESCRIPTORS: (\*RADIOACTIVE BATTERIES, \*REVIEWS), DESIGN, RADIOACTIVE ISOTOPES, MANUFACTURING METHNOS, SEEBECK EFFECT, PHOTOELECTRIC EFFECT, EAST GERMANY
IDENTIFIERS: \*RADIOISOTOPE BATTERIES, THERMIONIC POWER GENERATION, TRANSLATIONS

Atomic powered batteries as energy sources in space research and operations. Their characteristics are compared with those of chemical batteries and radioactive decay energy into electrical energy are considered along with the various methods of advantages and disadvantages are pointed out, including economic factors favoring or disfavoring their use. The various methods of converting A study was made of the development and use of constructing the batteries.

3

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 733 890 10/3 EAGLE-PICHER CO JOPLIN MO COUPLES DEPT Battery, Nickel-Cacinium BB-460()/U.

DESCRIPTIVE NOTE: Final rept. Mar 70-Apr 71, NOV 71 45P Brown, Harry L.; Carr, Earl

CONTRACT: DAABO7-70-C-0146

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, RELIABILITY(ELECTRONICS)), NICKEL, CADMIUM, ENVIRONMENTAL TESTS, DESIGN IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

33

The report discusses the design and testing of a high energy density BB-460()/U vented nickel-cadmium 20 ampere-hour battery. These batteries were subjected to U. S. Army environmental level testing.

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### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL ND. ZOMD7
AD- 733 422 10/3

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT Battery BB-674( )/U Nickel-Zinc

3

DESCRIPTIVE NOTE: Final rept. Apr 70-May 71, NOV 71 46P Broglio, Edward P. ;

· Secondary.

3

NOV 71 46P Broglic CONTRACT: DAAB07-70-C-0171 PROJ: DA-1-T-662705-A-05302 TASK: 1-T-662705-A-05302

MONITOR: ECOM 0171-F

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES,
RELIABILITY(ELECTRONICS)), NICKEL, ZINC, DESIGN,
VIBRATION, SHOCK RESISTANCE, LOW-TEMPERATURE BATTERIES,
TESTS, ENVIRONMENTAL TESTS
IDENTIFIERS: ZINC CELLS
(U)

The design, development and test of the BB-674()/U battery is described in detail. The BB-674()/U is a 4 cell nickel-zinc secondary battery. It is rated at 6.5 volts and 35 amperehours capacity. The design has 40 A-H of positive capacity in standard sintered nickel plates and teflonated ZnO negative plates. The zinc plates have almost 4 times the required coulombic capacity and are equal in area to the positive plates but are edge densified to retard shape change. The searator consists of 2 layers of fibrous visking plus pellon bags on both positive and negative electrodes. The BB-674()/U successfully completed its qualification test program for advanced development models of this battery. The yibration, low temperature charge retention, cycle vibration, low temperature charge retention, cycle life + high rate tests. As a result of this program, the BB-674()/U design was considered to have passed qualification testing. (Author) (U)

UNCLASSIFIED

AD- 733 422

ZOM07 SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N

Cadmium-Air Cell Studies

3

DESCRIPTIVE NOTE: Research and development technical Wagner,Otto C. ; DA-1-T-662705-A-053 PROJ: DA-1-T-662705-A-05 . ECOM-3451 19P REPT. NO

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STCRAGE BATTERIES, DESIGN), CADMIUM, AIR, AGING(MATERIALS), CATHODES(ELECTROLYTIC CELL), COSTS (U) IDENTIFIERS: \*CADMIUM AIR CELLS (U)

following characteristics: 42 watthours/pound; 2.35 wwwatthours/cu in; Price - about \$500.00; \$0.0017 constructing the unit cells with washed dry tharged cadmium anodes. A paper design of a 24 volt, 25 deliver at least 500 deep discharge cycles without any significant loss in electrical capacity and without any decrease in closed circuit potential. However, after one year's storage (at room temperature), the cell becomes cathode limiting with a resulting 15% loss in electrical capacity A cadmium-air cell has been developed that will poisoning of the air-cathode can be avoided by ampe: e-hour cadmium-air battery indicates the per watthour per cycle (assuming 500 cycles). and a large drop in cell potential. Cadmium

### UNCLASSIFIED

ZOMO2 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 733 289

Engineering Evaluation of Aircraft Batteries.

3

DESCRIPTIVE NOTE: Research and development technical

Duze, Sylvia REPT. NO. ECOM-3456 PROJ: DA-1-T-662705-A-053 36P rept.,

1-T-662705-A-05302

TASK:

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE\_BATTERIES, AIRCRAFT EQUIPMENT), RELIABILITY(ELECTRONICS). ALKALINE CELLS, LEAD, CADMIUM, NICKEL, SILVER, ZINC, SPECIFICATIONS
IDENTIFIERS: LEAD ACID BATTERIES, NICKEL CADMIUM BATTERIES, AVIONICS, SILVER ZINC BATTERY CELLS

3

3 Batteries in the smallest and lightest design must be capable of delivering high rate currents under all ambients for starting power, have good nigh rate charge acceptance and be available in the fully charged state in case of emergency. The report details all the problem areas, evaluates the various aincraft use, describes the redesign efforts of the Military Services, and presents a critique of Changes in aircraft technology and advances in electronic and electrical equipment desing have caused increased demands for electric power. secondary electrochemical systems in terms of specifications covering aircraft batter.es. (Author)

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N

Alkaline Cadmium Anode Studies.

3

DESCRIPTIVE NOTE: Research and development technical

Wagner, Otto C.; Smith, 7 Robert rept.,

NO. ECOM-3462 DA-1-T-662705-A-053

1-T-662705-A-05302 PROJ:

# UNCLASSIFIED REPORT

3 3 (\*ANODES(ELECTROLYTIC CELL), \*CADMIUM COMPOUNDS), OXIDES, ALKALINE CELLS, ADDITIVES, IRON OXIDES, RELIABILITY(ELECTRONICS), TEST METHODS
IDENTIFIERS: NICKEL CADMIUM BATTERIES, \*CADMIUM AIR CELLS, CADMIUM ELECTRODES, IRON(III) OXIDE, TITANIUM(IV) OXIDE (+STORAGE BATTERIES, DESIGN), DESCRIPTORS:

 $\Xi$ electrical capacity during prolonged deep discharge cycling. Ferric oxide which is a very beneficial cadmium extender in cadmium air cells and in negative maximum weight and volume energy densities in nickellimiting nickel-cadmitm cells, was detrimental to the At the present time, the best cadmium anode in terms of maximum utilization of active materials and cadmium cells is a sponge cadmium electrode with 5% little affect on the capacity of the cadmium anode. after 5 cycles. Other additives, such as an indium expander and a TiO2 extender, were found to have nickel carbonyl conductor. In addition, this electrode exhibited the best maintenance of

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB

Evaluation Program for Secondary Spacecraft Cells. Acceptance Test of Gulton Industries, Incorporated 12 and 20 Ampere-Hour Adhydrode Cells.

3

Bruess, E. C. NEPT. NO. QE/C-67-1

# UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Also available as N67-27639. See Also AD-729 291.

DESCRIPTORS: (\*STORAGE BATTERIES,
RELIABILITY(ELECTRONICS)), TEST METHODS, NICKEL,
CADMIUM, SPACECRAFT COMPONENTS, LEAKAGE(FLUID)
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, CADMIUM

3 Evaluation of Gulton Industries, Inc. 12 and 20 ampere-hour Adhydrode Secondary Spacecraft Cells was begun. The object of the evaluation program was to gather specific information concerning Secondary spacecraft cells. Information concerning including cycle life under various electrical and environmental conditions, is of interest to power performance characteristics and limitations, systems designers and users. (Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

ELPOWER CORP SANTA ANA CALIF

High Energy Density, Long Life Secondary Battery (Silver-Zinc) Assembly BB 634

3

DESCRIPTIVE NOTE: Final rept. 31 Oct 68-15 Oct 71, Sparks, Richard H. ; CONTRACT: DAAB07-69-C-0093

PROJ: DA-1-T-662705-A-053 I-T-662705-A-05302

MONITOR: ECOM

# UNCLASSIFIED REPORT

RELIABILITY(ELECTRONICS), ENVIRONMENTAL TESTS, VIBRATION, DROP TESTING, TEMPERATURE, HUMIDITY, LIQUID IMMERSION TESTS, ZINC, SILVER, MECHANICAL DRAWINGS, TEST 3 3 IDENTIFIERS: \*ZINC CELL:, \*SILVER ZINC BATTERY CELLS (\*STORAGE BATTERIES, DESIGN),

3 tests included vibration, shock, drop tests, and high side in the man-pack configuration. The battery assembly is rated at 24 volts and 9.0 ampere bours or development program and fully documents the battery The purpose of the contract was the design, development, nd testing of the silver-zinc battery assembly BB 534 ()/U. This battery assembly is a military-ruggedized design consisting of four assembly design. Complete engineering drawings are included in the final report as well as artist's subjected to a complete range of electrical tests. 12 volts and 18.0 ampere-hours. The design goals were successfully accomplished. The environmental visualization of the battery assembly. (Author) and low temperature, humidity, immersion, and altitude. In addition these batteries were (4) BB 461 ()/U batteries stacked side by The final report outlines the design and

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY COLO AD- 732 198

A Lightweight High Energy Battery,

3

Fannin, Armand A. , Jr.; King, Lowell A.; Seegmiller, David W.; REPT. NO. SRL-TR-71-0019 PROJ: AF-7903 136

TASK: 790300

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, \*ALUMINUM), CHLORINE, ALUMINUM COMPOUNDS, CHLORIDES, SODIUM CHLORIDE, SUPPLEMENTARY NOTE: Presented at the 1971 AFSC Science and Engineering Symposium, Dayton, Ohio, 5 Oct

3 IDENTIFIERS: MOLTEN SALT ELECTROLYTES, CHLORIDE IONS, \*HIGH ENERGY BATTERIES ELECTROLYTES

material.. The electrochemical reactions take place in a molten salt electrolyte maintained at 125with a list of desired characteristics of high energy prediction of still other electrodes and electrolytes to the voltage expected from the aluminum chlorine cell, and yields a 25 percent increase in theoretical energy output. A model of the electrolyte structure batteries, and are contrasted with those of existing under development. Studies of the aluminum electrode revealed an unexpectedly high cell voltage The characteristics of a newly devised high energy output battery are described. This battery 200C. The properties of this battery are compared conventional batteries and advanced batteries now arising from concentration differences in the electrolyte. This voltage increment can be added is postulated which explains the unusually high utilizes aluminum and chlorine as the reactive voltages. This model provides a guide for the that might be utilized in high energy output batteries. (Author)

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 731 473

Engineering Evaluation of Primary Organic Electrolyte D. Cells.

3

DESCRIPTIVE NOTE: Research and development technical Wilburn, Nicholas T.; 27P rept

DA-1-T-662705-A-053 ECOM-3444 REPT. NO.

1-T-662705-A-05302 TASK:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY CELLS, RELIABILITY(ELECTRONICS)), (\*DRY CELLS, RELIABILITY(ELECTRONICS)), FEASIBILITY STUDIES, LITHIUM, STORAGE, THERMAL STABILITY, (\*\*\*) 3 \*LITHIUM CELLS, \*ORGANIC BATTERIES, \*HIGH ENERGY BATTERIES DENTIFIERS:

requirements, normally met with magnesium or mercury An engineering evaluation program was conducted on D size primary lithium-organic electrolyte cells. They were evaluated under a variety of conditions to determine feasibility of the system to meet performance capability in terms of energy density, representative sensor and manpack communications Cell conditioning may be required in some cases. Initial voltage delay was found to exist at low temperature or after high temperature storage. retention following storage at 130F and 160F. low temperature (-20F) operation, and charge dry hatteries. The cells demonstrated good

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ATOMICS INTERNATIONAL CANOGA PARK CALIF

Semiconductor Cathodes for High Energy Batteries,

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CONTRACT: F19628-67-C-0387 PROJ: AF-3659

71-0492 AFCRL MONITOR:

# UNCLASSIFIED REPORT

Sources Symposium (24th), held on 19-21 May 70, in Annual Proceedings Power Availability: Pub.

3 \*SEMICONDUCTORS), ELECTROLYTES, BATTERIES + COMPONENTS, ELECTROCHEMISTRY, POROUS MATERIALS, CADMIUM COMPOUNDS, FLUORIDES, HALIDES, RELIABILITY(ELECTRONICS)
IDENTIFIERS: LITHIUM PERCHLORATE, \*ORGANIC BATTERIES,
\*BATTERY ELECTRODES, \*CADMIUM FLUORIDE, HIGH ENERGY DESCRIPTORS: (\*CATHODES(ELECTROLYTIC CELL),

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fluoride in a lithium perchlorate-propylene carbonate of earlier studies on semiconductor electrodes and by of the semiconductor approach to the construction of improved battery cathodes requires carerul preparation of the conductive material, provision of adequate electronic contact to the external circuit, and the avoidance of deleterious film formation during the discharge reaction. These requirements are specifically discussed with respect to cadmium recent work in these laboratories on n-type cadmium emphasized in this investigation, the basic concept Electronic conductivity in a solid cathode material provides an additional mechanism for the discharge process. This concept is supported by the results of a solid state electronic discharge mechanism is equally valid, for appropriate electrode materials, solution. Practical advantages include nigher discharge rate and longer shelf life. Application in aqueous and nonaqueous inorganic electrolytes. fluoride and transition metal halide cathodes. Although organic electrolyte batteries were

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 731 029 10/3 NAVAL ORDNANCE LAB WHITE DAK MD Development of Long Life Zinc-Oxygen Cells,

JUN 71 46P Weller, Richard D. REPT. NO. NOLTR-7:-81 PROJ: ORD-531-215/UF17-351-503

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY CELLS, ZINC), (\*WATER-ACTIVATED BATTERIES, ZINC), (\*MINES(ORDNANCE), WATER-ACTIVATED BATTERIES), RELIABILITY(ELECTRONICS), OXYGEN, ELECTRODES, ELECTROLYES, CATALYSTS, TEST METHODS, AIR, DESIGN, HYDROXIDES, NICKEL IDENTIFIERS: \*ZINC AIR BATTERY CELLS, ZINC CELLS, \*METAL AIR BATTERIES, \*RESERVE BATTERIES, (U)

The feasibility of using zinc-oxygen batteries for long-term discharges was investigated with the objective of attaining a one-year discharge lifetime and a five-year storage lifetime at uncontrolled temperatures. Zinc and oxygen electrodes were developed and used to construct zinc-oxygen cells for discharge testing. Cell lifetime was limited by premature oxidation of the zinc electrode due to corrosive chemical reactions set up by the nickel. The five-year storage requirement dictates the use of a reserve configuration with electrolyte kept in individual cell reservoirs during storage and activation systems were done based on the electrode activation systems were done based on the electrode and cell designs developed. (Author)

### UNCLASSIFIED

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 730 867 10/3 DAYTON UNIV OHIO DEPT OF PHYSICS An Intercell Planar Heat Pipe for the Removal of Heat During the Cycling of a High Rate Nickel Cadmium Battery,

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71 8P Mahefkey, E. T. ; Kreitman,

M. M.; CONTRACT: F33615-67-C-1027 PROJ: AF-7885 TASK: 788500

MONITOR: ARL 71-0223

# UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of the Electrochemical Society, vil8 ng p1382-1386 Aug 71. DESCRIPTORS: (\*STORAGE BATTERIES, \*HEAT EXCHANGERS), PERFORMANCE(ENGINEERING), HEAT TRANSFER, NICKEL, CADMIUM, EFFECTIVENESS
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, \*HEAT

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Two 22 A-h nickel-cadmium cells were continuously cycled at a 1c charge rate and a 2c discharge rate, with cooling provided by an intercell planar (rectangular cross section) heat pipe. For purposes of comparison, thermocouple measurements were also taken with an aluminum conduction fin substituting for the heat pipe. The aluminum fin and heat pipe were cooled, by room temperature forced air. Thermally insulated cells were also cycled at the same rates. Cell case temperatures were measured during cycling, and a maximum of 29c with a 5c thermal excursion was noted with the heat pipe under conditions of thermal equilibrium which were observed after 3 complete cycles. For the aluminum fin configuration a maximum of 42c with a 7c thermal excursion was obtained near thermal equilibrium after 5 complete cycles. The effectiveness of the heat pipe in removing battery heat was calculated to be approximately 26% greater than the aluminum fin at or near equilibrium. It is surmised that the significantly lower operating temperatures produced by the heat pipe should lead to an important lengthening of battery cycle life and an associated reduction of capacity degradation.

PAGE

(Author)

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD~ 730 345 10/2
BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS

Failure Mechanisms and Accelerated Life Tests of Nickel-Cadmium Batteries.

DESCRIPTIVE NOTE: Annual technical rept. no. 2, 1 May 70-30 Apr 71, SEP 71 99P McCallum, John ; Miller,

Gerald H.; CONTRACT: F33615-69-C-1537

PROJ: AF-3145 TASK: 314522

MONITOR: AFAPL TR-70-44-2

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Annual technical rept. no.
1, AD-871 973.
DESCRIPTORS: (\*PRIMARY CELLS, RELIABILITY(ELECTRONICS)),
(\*ALKAINE CELLS, RELIABILITY(ELECTRONICS)), ACCELERATED
TESTING, NICKEL, CADMIL', FALLURE(ELECTRONICS), THERMAL
CONDUCTIVITY, THERMAL STABILITY, SPACECRAFT
(U)
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES
(U)

The report covers research results of the second year of a 3-year program to develop accelerated-life testing procedures for sealed spacecraft cells and batteries. (Author) (U)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 730 336 17/6 SPERRY RAND CORP CHARLOTTESVILLE VA SPERRY MARINE SYSTEMS DIV\*\*

Personnel Search Device.

3

DESCRIPTIVE NOTE: Final technical rept., SEP 71 13P Carpentier, Richard A.; Dial,

Kenneth G. ; CONTRACT: F33657-70-C-0403 MONITOR: RADC TR-71-183

### 201 - 1 - 102

UNCLASSIFIED REPORT

DESCRIPTORS: (\*MAGNETIC DETECTORS, \*MILITARY POLICE), (\*SMALL ARMS, MAGNETIC ANDMALY DETECTION), MAGNETERS, SENSITIVITY, ALKALINE CELLS, AUDITORY SIGNALS, EARPHONES, DESIGN, MAGNETIC FIELDS (U) IDENTIFIERS: NICKEL CADMIUM BATTERIES (U)

The objective of the effort was to develop a highly sensitive magnetic gradiometer (ferrous metal detector) packaged in a night stick. The equipment was designed to be camouflaged and otherwise concealed upon the user to permit limited covert operation in the search of concealed weapons. The sensitivity would permit personnel search without touching the person being searched. This report describes the gradiometer function. equipment design and problems and specifies on a flux gate gradiometer which permits a signal of 7.6 gamma measurement in the presence of the earth's magnetic field that can be as large as six tenths of an oersted or 60,000 gamma. (Author)

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AD- 730 345

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AND ENGINEERING LAB AD- 729 291

Evaluation Program for Secondary Spacecraft Industries, 100.0 Ampere-Hour Nickel-Cells. Acceptance Tests of Gulton Cadmium Cells,

Thomas, R. E. REPT. NO. QE/C-71-283 PROJ: NASA-PO-W12397 JUL 71

# UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*STORAGE BATTERIES, RELIABILITY(ELECTRONICS)), TEST METHODS, NICKEL, CADMIUM, ELECTROLYTES, LEAKAGE(FLUID)
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, SHORT CIRCUITS

3 The purpose of the acceptance test program is to insure that all cells put into the life cycle program are of high quality by the removal of cells found to have electrolyte leakage, internal shorts, low capacity, or inacility of any cell to recover its open circuit voltage above 1.200 volts after cell short tests. Twenty three 100.0 ampere-hour nickelcadmium spacecraft cells were purchased and

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MO7

1-728 431 11/3 10/3 NAVAL RESEARCH LAB WASHINGTON D C AD- 728 431

Cycling Anodic Coatings on Pure and Antimonial Lead in H2504,

3

23P 71

Burbank, Jeanne

UNCLASSIFIED REPORT

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DESCRIPTORS: (\*ANODIC COATINGS, \*LEAD), (\*LEAD ALLOYS, ANODIC COATINGS), (\*STORAGE BATTERIES, ELECTRODES), SULFURIC ACID, ANTIMONY ALLOYS, X-RAY DIFFRACTION ANALYSIS, ELECTRON MICROSCOPY
IDENTIFIERS: LEAD ACID CELLS Availability: Pub. in Power Sources, v3 p13-34

33

with further cycling. The anodic oxide comprised small needle-like crystals which grew with cycling. There was a gradual increase in the amount and crystallinity of beta-Pb02 in a soft porous outer layer. Attached to the metal was a layer of alphabout. On antimony alloy the capacity continually increased with cycling. A compact coating of small crystals of alpha- and beta-Pb02 was formed. It was concluded that beta-Pb02. Electrochemical cycling, x-ray diffraction and electron microscopy were used to study anodic coatings on pure and antimonial lead. On pure lead a maximum capacity developed that did not increase acts as a nucleating catalyst for beta-Pb02 in does not bond to alpha-Pb02 and that antimony

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the corrosion product. (Author)

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 728 047 10/3 ATOMICS INTERNATIONAL CANGGA PARK CALIF

Interhalogen Cells.

3

DESCRIPTIVE NOTE: Final rept. 21 Apr 70-21 Mar 71, JUN 71 66P Nicholson, M. M. ; Iverson, M. L.;

CONTRACT: N00019-70-C-0376

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY CELLS, \*CHLORINE COMPOUNDS),
(\*LITHIUM ALLOYS, \*BATTERIES + COMPONENTS), MAGNESIUM
ALLOYS, FLUORIDES, ELECTROLYTES, ELECTRODES,
RELIABILITY(ELECTRONICS), ELECTROCHEMISTRY
IDENTIFIERS: \*LITHIUM CELLS, CHLORINE TRIFLUORIDE,
CHLORINE FLUORIDES, HIGH ENERGY BATTERIES, HYDROGEN
(U)

The development of a chlorine trifluoride battery cathode in anhydrous hydrogen fluoride was continued in this program, and the feasibility of a lithium alloy anode in the same solvent was investigated. As a current collector for the cathode system, platinum was far superior to nickel, copper, aluminum, or boron carbide. The cathode process on platinum was characterized in some detail by voltammetric measurements on solutions of CIF3, CIF, and mixtures thereof. It was concluded that the CIF3 system lacks adequate recharge capability for secondary battery applications, although it is a very active primary cathode. Lithium-aluminum and lithium-magnesium alloys ranging in formal compositions from Li9Al to LiA12 and Li2Mg to LiMg2 were examined for chemical compatibility with a 1 M LiF-FF electrolyte and for anodic reactivity in the same medium. Lithium alloys thus show definite promise as anodes for reserve cells in HF. From the results an LiA1loy-CIF3 cell in HF is

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 727 126 10/3 HOWARD (P L) ASSOCIATES INC CENTREVILLE MD Development of a High Power Density Silver Oxide-Zinc Liquid Electrode Bipolar Primary Battery.

3

DESCRIPTIVE NOTE: Final rept.,
JUN 71 33P Howard, Paul L.;
CONTRACT: NO0019-70-C-0204

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY CELLS, \*ALKALINE CELLS), SILVER COMPOUNDS, OXIDES, ZINC, LIQUIDS, ELECTRODES (U) IDENTIFIERS: \*SILVER ZINC BATTERY CELLS (U)

The report covers the development of a pasted AgO primary battery electrode which is solid until the time it is wet down and then it becomes a mushy electrode which performs equal to or better than the present sintered. Charged and assembled AgO electrode. Similarly the Zinc electrode behaves the same way. This new development simplifies the processing and assembly of duplex primary battery electrode and gives a higher power density than conventional batteries. Prototype two cell units were made and successfully tested.

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AD- 728 047

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PAGE

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SEARCH CONTROL NO. ZOMO7

DDC REPORT BIBLIDGRAPHY

AD- 727 066

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT

A Low Temperature Kiniature Automatically

Activated Magnesium Battery.

DESCRIPTIVE NOTE: Final rept. Apr 69-Apr 71, APR 71 12:P :

CONTRACT: F33615-69-C-1760

PROJ: AF-3145, AF-691C

WONITOR: AFAPL

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

AD- 726 946

Engineering Evaluation of Standard Line Reserve Low Temperature Batteries.

DESCRIPTIVE NOTE: Technical rept.,

## UNCLASSIFIED REPORT

DESCRIPTORS: (\*LOW TEMPERATURE BATTERIES, RELIABILITY(ELECTRONICS)), PRIMARY BATTERIES, TRANSMITTER RECEIVERS, PORTABLE EQUIPMENT, ACCEPTABILITY, MAGNESIUM, MAGNESIUM OXIDES, PERCHLORA IDENTIFIERS: AN/PRC-70, \*RESERVE BATTERIES

batteries, to further probe the operational characteristics under a wide range of conditions, to determine operational limitations and to establish areas where there is need for further research and development to improve low temperature performance. The present battery designs are most efficient at -40F to power intermittent equipment where the power requirements of one specialized application, the and the Army Controlled Air Drop Cargo System (CADCS)). Efficiency is mush reduced with the present designs when low power demands exist, such as for the AN/PRC-25 transceiver. demands are moderate to high (e.g. AN/PRC-70 AN/PRC-70 transceiver. This report describes an internal engineering evaluation on these Batteries BA-838( )/U (four pounds) and BA-839( )/U (six pounds) had been designed, fabricated and fully qualified to meet the

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Author)

ARMY ELECTRONICS COMMAND FORT MONMOUTH N

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Almerini, Achille L. ; MAY 71 35P A1 REPT. NO. ECOM-3427 PROJ: DA-1-T-662705-A-053

TASK: 1-T-662705-A-05302

3 DESCRIPTORS: (\*LOW TEMPERATURE BATTERIES, DESIGN), PRIMARY BATTERIES, MAGNESIUM, WET CELLS, ACTUATORS, AUTOMATIC, MINIATURE ELECTRICAL EQUIPMENT

UNCLASSIFIED REPORT

TR-71-25

devices. The specification highlights include a 10 minute yield at 30 watts from a 10 cubic inch battery in -40 to +125F ambients and at 40,000 ft. of this gas generator activated battery is explained and the development program is outlined. altitude. The goals and the approach in a two phase program are presented. Included are the results of manganese-dioxide-mercury oxide unit. The operation The report covers the development of a magnesium automatically-activate battery. The battery is intended to supply power for expendable electronic both evaluations conducted under the contract. In the preliminary design phase, the battery evolved from a 100% mercury oxide concept to a 50-50 (Author)

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

10/3 TYCO LABS INC WALTHAM MASS

Electrode Reactions in Propylene Carbonate, Preferential Solvation Effects of Water On

Butler, James N.; Cogley,

David R. ; Grunwald, Ernest ; REPT. NO. C-948, Scientific-1 CONTRACT: F19628-70-C-0095 PROJ: AF-8659 TASK: 865904

MONITOR: AFCRL

### UNCLASSIFIED REPORT

Branders Univ., Waltham, Mass.

DESCRIPTORS: (\*ELECTROLYTES, SOLVENT ACTION), (\*OXYGEN HETEROCYCLIC COMPOUNDS, \*ELECTROCHEMISTRY), ELECTROLYTIC CELLS, WATER, ELECTRODES. MOLECULAR ASSOCIATION, NUCLEAR MAGNETIC RESONANCE, BATTERY COMPONENTS, ELECTRIC (U) IDENTIFIERS: LITHIUM CELLS, ORGANIC BATTERIES, CHRONOPOTENTIOMETRIC ANALYSIS, \*PROPYLENE CARBONATES, \*SOLVATION, HIGH LARRY BATTERIES (U) n71 p14-17 Jan-Feb 71. SUPPLEMENTARY NOTE: Prepared in cooperation with Availability: Pub. in Ingenieurs EPCI (Paris),

Recent NMR studies of ionic solvation by water in propylene carbonate electrolytes have shown that Li(+), Na(+), and Cl(-) tend to be preferentially solvated by water, whereas larger polyatomic ions such as Et4N(+), ClO4(-), FF6(-) and tetraphenyiboride are negligibly solvated by water. These results are used in interpreting a number of electrochemical effects relating to high energy battery operation and chronopotentiometric measurements. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

BATTELLE MEMORIAL INST COLUMBUS OHIO COLUMBUS LABS 10/3

DESCRIPTIVE NOTE: Annual rept. no 3, 1 Apr 70-31 Mar

Lithium Battery Development

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Semones, D. E. : McCallum 81P 7 NOO

CONTRACT: F33615-68-C-1282 . NO. BAT-8917-3 REPT

MONITOR: AFAPL TR-71-49 AF-3145 TASK:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, \*LITHIUM), ELECTRODES, ELECTROLYTES, NICKEL, NICKEL COMPOUNDS, THIOCYANATES, ORGANIC SOLVENTS, POTASSIUM COMPOUNDS, HYDROXIDES, AMMONIUM COMPOUNDS, COMPO SUPPLEMENTARY NOTE: See also Annual rept. no. 2, AD-870 688.

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Common to both the positive electrode compound and to the electrolyte solute. An electrolyte resistivity lower than 1000 ohm-cm also was sought in these studies as well as stability of the electrolyte with the positive electrode compound and with lithium. Characteristics of the candidate electrode materials electrolyte development was the presence of an anion were considered, including theoretical voltages and idealized weight relationships and, therefore, the maximum watt hours per pound that could be expected. Two dozen separate compounds were considered in this preliminary analysis from among seven general Second, electrolytes to be used in combination with thiocyanates, hydroxides, sulfides, and methoxides. classes of inorganic compounds that included the the candidate electrode compound were developed. metal salts of carbonates, cyanides, cyanates, Compounds for use as positive electrodes in a rechargeable lithium battery. First, desired One prerequisite for rechargeability in the The report describes research on inorganic

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AD- 726 607

ZOMOZ

AD- 726 814

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#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AD- 726 407

Evaluation Program for Secondary Spacecraft Cells. Synchronous Orbit Testing of General Electric Company 12.0 Ampere-Hour Nickel-Cadmium Cells,

Christy, D. E. REPT. NO. QE/C-71-183 PROJ: NASA-PO-W12397 JUN 71

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*SIORAGE BATTERIES, \*SPACECRAFT COMPONENTS), (\*ALKALINE BATTERIES, SPACECRAFT COMPONENTS), NICKEL, CADMIUM, RELIABILITY(ELECTRONICS), ACCEPTABILITY ((\*\*ACCEPTABILITY\*\*)), NICKEL CADMIUM BATTERIES, EVALUATION

orbit regime. Such a regime simulates a space satellite maintaining a position over a fixed point auxiliary electrodes, operating under a synchronous on the earth as the earth rotates on its axis and The purpose is to gather performance information concerning sealed nickel-cadmium cells, with revolves about the sun. (Author)

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#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

AD- 726 385 10/3 MALLORY (P R) AND CO INC BURLINGTON MASS LAB FOR PHYSICAL

Long Shelf Life Organic Electrolyte Battery.

3

Athearn, L. F. ; Dey, A. N. DESCRIPTIVE NOTE: Rept. no. 4 (Final), JUN 71 86P Athearn, L. F.

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CONTRACT: DAAB07-70-C-0076 PROJ: DA-1-X-628012-D-628 MONITOR: ECOM 0076-F

### UNCLASSIFIED REPORT

RELIABILITY(ELECTRONICS)), STORAGE, LITHIUM, ELECTROLYTES, ORGANIC COMPOUNDS, TEST METHODS, DESIGN, LEAKAGE(FLUID), AGING(MATERIALS) IDENTIFIERS: \*LITHIUM CELLS, \*ORGANIC BATTERIES, \*HIGH ENERGY BATTERIES DESCRIPTORS: (\*PRIMARY BATTERIES

attained. Reduced temperature storage is recommended for the cells and batteries. Some redesign of cell and battery structures is required to prevent electrolyte leakage and internal corrosion observed in the delivered end items. (Author) The fabrication of prototype organic electrolyte-lithium cells having wide operating temperature range the 36 volt batteries were tested at room temperature temperature using the specified discharge regime was Seventy of these cells were assembled and delivered Ø for evaluation tests. In tests of samples of these Derformed. Improved cells of the type used to make on the specified loads. The contractual objective for charge retention, high efficiency performance densities of 95 watt hours per pound at room temperature and 55 watt hours per pound at room temperature and 55 watt hours per pound at -30C were obtained. Similar cell components were assembled to make fifteen 36 volt batteries with diameter of 2.75 in. and a height of 5.0 inches. following three months storage at 55C, was not The discharge of a prototype battery at room and high energy density has been completed.

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AD- 725 849 DEPT

Evaluation Program for Secondary Spacecraft Industries, Inc. 6.0 Ampere-Hour Nickel-Cells. Acceptance Test of Eagle-Picher

3

Christy, Donald QE/C-71-188 NASA-PO-W12397

### UNCLASSIFIED REPORT

3 RELIABILITY(ELECTRONICS)), (\*ALKALINE BATTERIES, RELIABILITY(ELECTRONICS)), TEST METHODS, NICKEL, CADMIUM, LEAKAGE(FLUID)
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, CADMIUM CELLS, SHORT CIRCUITS ( \* STORAGE BATTERIES, DESCRIPTORS:

3 The purpose of the acceptance test was to provide a 'base line' reference, prior to life cycling, for new cells. It also provides a screening against cells that are obviously bad due to internal shorts, ability to withstand long periods of overcharge, and internal resistance measurements, all cells complete 6.0 ampere-hour nicke -cadmium secondary spacecraft the entire series of tests. Twenty Eagle-Picher cells with auxiliary electrodes were tested. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY AD- 725 848

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION DEPT

Evaluation Program for Secondary Spacecraft Cells. Acceptance Test of General Electric Company 6.0 Ampere-Hour Nickel-Cadmium Cells W/ Signal and Recombination Electrodes,

3

Christy, Donald E. JUN 71 14P REPT. NO. QE/C-71-187 PROJ: NASA-PO-W12397

### UNCLASSIFIED REPORT

3 RELIABILITY(ELECTRONICS)), (\*ALKALINE BATTERIES, RELIABILITY(ELECTRONICS)), TEST METHODS, NICKEL, CADMIUM, LEAKAGE(FLUID) IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, CADMIUM CELLS, SHORT CIRCUITS DESCRIPTORS: (\*STORAGE BATTERIES,

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3 The purpose of the acceptance test was to provide a base line' reference, prior to life cycling, for new cells. It also provides a screening against cells cell capacity, internal shorts, ability to withstand long periods of overcharge, and internal resistance regard to physical dimensions, electrolyte leakage, that are obviously bad due to internal shorts or recombination electrodes manufactured by General gross leakage. The reference is provided with measurements. Six ampere-hour nickel-cadmium secondary spacecraft cells with signal and Electric Company were tested. (Author)

AD- 725 849

EAGLE-PICHER CO JOPLIN MO COUPLES DEPT 10/3

Magnesium/Meta-Dinitrobenzene Reserve-Type Battery for Field Application. Miniature Reserve Type Magnesium Battery for Operation from +125 F to -40 F

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DESCRIPTIVE NOTE: Final rept. Mar 70-Apr 71, JUN 71 58P Russell, Jerry L. ; CONTRACT: DAABO7-70-C-0121 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302

### UNCLASSIFIED REPORT

MONITOR: ECOM 0121-F

DESCRIPTORS: (\*PRIMARY BATTERIES, DESIGN), (\*WATER ACTIVATED BATTERIES, DESIGN), (\*NITROBENZENES, PRIMARY BATTERIES), MAGNESIUM, TEST METHODS, RELIABILITY(ELECTRONICS), PERCHLORATES, NIGHT VISION, ELECTROLYTES IDENTIFIERS: \*MAGNESIUM CELLS, MAGNESIUM PERCHLORATE, NITRO COMPOUNDS, \*RESERVE BATTERIES

3 battery for powering second generation night vision devices such as goggles and crew served weapon sights. The battery occupies 0.59 cubic inches, weighs 0.64 ounces and yields as high as 0.75 wattpart of the report describes the design and testing efficiency. The best power density obtained by the described design was 26 watt-hrs/pound. The second dioxide system but was determined to have serious first part of the report describes the design employing a magnesium/magnesium perchlorate/metadinitrobenzene system, which was hoped to yeild a power' density in excess of that of the manganese of a reserve-type miniature 2.5 volt magnesium and testing of a primary reserve type battery hrs. It can operate in temperature ambients technical problems which limit its use and ranging from +125F to -40F. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N

3 Sealed Nickel-Cadmium Battery Assembly BB-655()/U (Engineering Evaluation).

DESCRIPTIVE NOTE: Research and development technical Settembre, E. J.; APR 71 28P SE REPT. NO. ECOM-3411 PROJ: DA-1-T-662705-A-053 rept.,

1-T-662705-A-05302

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*ALKALINE BATTERIES,
RELIABILITY(ELECTRONICS)), STORAGE BATTERIES, NICKEL,
CADMIUM, BATTERY COMPONENTS, ELECTRIC BATTERIES,
CONTAINERS, PRINTED CIRCUITS, REINFORCED PLASTICS, EPOXY
RESINS, ACRYLONITRILE POLYMERS, BUTADIENES, STYRENE
PLASTICS, ACCEPTABILITY
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, ACRYLONITRILE
BUTADIENE STYRENE PLASTICS, FIBERGLASS REINFORCED

3 cell nestis housed in a lightweight, rugged, ABS TANDARD, MANPACKED BATTERY CASE. This battery has the capability of furnishing .0 Ah at 2+ volts or 14.0 Ah at 12 volts, and weighs 12.5 lbs. The battery ssembly yields 13 watthours per pound and 0.7 watthours per cubic inch and meets severe electrical, This assembly is the first of the standard line ABS housed batteries required to meet these rugged high energy density, sealed, nickel- admium battery assembly are presented. It consists of twenty seriesConnected, sealed nickel-cadmium F cells restrained in a nest between twofiberglass circuit The physical and electrical characteristics for a environmental tests include vibration, bounce and four foot drop testing on all corners, faces and edges with a cover and with simulated equipment. boards and potted with rigid epoxy potting. The environmental and mechanical tests. The environmental requirements. (Author-PL)

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ESB INC YARDLEY PA AD- 722 802

BA-540( )/U Water Activated 2-Pound Zinc Air Battery.

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Final rept. 17 Apr 70-16 Feb 71, Randall, Bernard; CONTRACT: DAABO7-70-C-0157 471 DESCRIPTIVE NOTE: APR 71

PROJ: DA-1-T-662705-A-053

1-T-662705-A-05302 MONITON: ECOM 0157-F

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*WATER ACTIVATED BATTERIES, TEST METHODS), (\*PRIMARY BATTERIES, \*ZINC), MANUFACTURING, DESIGN, ASSEMBLY, RELIABILITY(ELECTRONICS), AIR IDENTIFIERS: \*ZINC AIR BATTERY CELLS, \*METAL AIR

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3 design, the construction technique, and the testing results and conclusions. (Author) cycle, with the energy density ranging from 64 watt following 7-day activated stand and severe-physical discharge requirements. The batteries delivered up to fabricate 42 BA-540( )/U two-pound zinc air water activated batteries. The batteries were fabricated and tested from 0f to 125f and environments with all tests equaling or exceeding 75F. The report discusses the devalopment of the none-month contract ESB Incorporated fabricated hrs/1b. at 0F to as high as 118 watt hrs/1b at The report describes the work performed under contract No. DAAB07-70-C-0157 with the United States Army Electronics Command. Under this to 14 Ahrs on an 18:2 receive-transmit duty

#### UNCLASSIFIED

SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

CALIFORNIA UNIV LOS ANGELES SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Energy, Nonaqueous Electro-Chemical Energy Design Studies for High Rate, High Conversion Systems.

3

Bennion, Douglas N.; Dunning DESCRIPTIVE NOTE: Final rept. 1 Aug 69-31 Jul 70 70 140P Bennion, [ ;Tiedemann, William H. ; John S. DEC

N00123-70-C-0188, N123(62738)57439A TM-44-31 UCLA-ENG-7078 CONTRACT: REPT. NO. MONITOR:

### UNCLASSIFIED REPORT

3 (\*STORAGE BATTERIES, ELECTROCHEMISTRY), (\*NITROBENZENES, \*ELECTROCHEMISTRY), ELECTROLYTES, ORGANIC SOLVENTS, REDUCTION(CHEMISTRY), AMMONIA, LIQUEFIED GASES, ELECTRODES, LITHIUM COMPOUNDS, ELECTRICAL CONDUCTIVITY, POROSITY IDENTIFIERS: \*LIQUID AMMONIA, \*LITHIUM CELLS, NITRO COMPOUNDS, NONAQUEOUS ELECTROLYTES, \*ORGANIC BATTERIES, \*BENZENE/DINITRO, \*HIGH ENERGY CELLS DESCRIPTORS:

3

3 to electrodes using sparingly soluble reactants has been developed. The results of numerical calculations based on this model show that mass transfer limiting Currents are possible in nonaqueous batteries using tests, though preliminary, indicate that the actual packaged energy density of the system may be low dimethyl sulfoxide (DMSD) solutions has been studied. The results show strong dependence of the reduction mechanism on the proton-donating ability electrolyte solution properties in liquid ammonia, carried out. A new, high voltage, high power density cell has been discovered. Results of cell the electrolyte, with an eight electron transfer energy density. The reduction of meta-dinitrobenzene (m-DNB) in liquid ammonia and in reaction mechanisms, solution properties, and theoretical design criteria for electrochemical energy conversion devices with potentially high Studies have been made of the electrochemical DMSO, and dimethyl sulfite (DMSU) have been Possible in ammonium nitrate-liquid ammonia Solutions. A mathematical model for porous such electrodes. In addition, studies of

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AD- 722 384

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

TRAPELO/WEST RICHMOND CALIF AD- 721 662

A Study of Conventional and Unconventional RADIAC Power Sources.

3

Sturman, Ivan ; DESCRIPTIVE NOTE: Final rept., REPT. NO. TLW-6068 CONTRACT: DAHC20-69-C-0122 DEC 70 74P OCD-2122F PROJ:

## UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*RADIATION MEASURING INSTRUMENTS, \*POWER SUPPLIES), CIVIL DEFENSE, PRIMARY BATTERIES, COSTS, MONITORS, THERMOELECTRICITY, THERMIONIC CONVERTERS, SOLAR CELLS, FUEL CELLS
IDENTIFIERS: RADIACMETERS, RADIACMETER POWER SOURCES, RESERVE BATTERIES

 $\widehat{\Xi}$ should be observed in the selection of RADIAC power identified and evaluated. The experimental methods and the results are described. Cautions that sources are described. Cost comparisons are made of power sources considered to be suitable D-cell substitutes and conventional D-cells.

Recommendations are made for RADIAC power sources and for further study topics. (Author) Feasible substitutes for RADIAC power sources are

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AD- 720 770

Evaluation Program for Secondary Spacecraft Cells: Acceptance Test of 6.0 Ampere-Hour Nickel Cadmium Secondary Cells (Ceramic Seals with Nickel Braze) Manufactured by General Electric Company.

3

FEB 71 22P REPT. NO. QE/C-71-45 PROJ: NASA-W12-397

## UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE BATTERIES, SPACECRAFT), ALKALINE BATTERIES, NICKEL, CADMIUM, ACCEPTABILITY, SEALS IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

The purpose of the acceptance test phase is to insure that all cells put into the life cycle program are of high quality by the removal of cells found to have electrolyte leakage, internal shorts, low capacity, or inability of any cell to recover its open circuit voltage above 1.150 volts after the cell short test. (Author)

ZOW0Z SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

FOOTE MINERAL CO EXTON PA AD- 720 600

Active Energy Storage Materials for Integrated Cell Stacks.

3

DESCRIPTIVE NOTE: Technical rept. 1 Jul 70-15 Jan 71, Fishwick, John H. ; Dremann, 316 MAR

CONTRACT: DAABO7-70-C-0173 PROJ: 1-T-662705-A-053 TASK: 1-T-662705-A-05304 Charles E. ;

MONITOR: ECOM 0173-1

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY SEPARATORS, COMPATIBILITY),
LITHIUM COMPOUNDS, ALUMINATES, ZIRCONATES, CALCIUM
COMPOUNDS, LITHIUM, CORROSIVE LIQUIDS, MANUFACTURING (U)
IDENTIFIERS: LITHIUM ALUMINATES, \*LITHIUM CELLS,
CALCIUM ALUMINATES, CALCIUM ZIRCONATE, HIGH ENERGY
BATTERIES

 $\widehat{\Xi}$ inorganic separator materials capable of continuous and protracted operation in contact with molten lithium metal and a fused LiCl-KCl eutectic. exploratory test performed under vacuum at 5900 for The report describes the preparation and properties The objective of the program is to develop suitable of seven materials based on the cations Li and Ca describes the manufacture of test pieces from the seven materials and the proliminary results of an and aluminate and zirconate anions. It also 96 h. An extensive bibliography is included. (Author)

#### UNCLASSIFIED

ZOW0Z SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

10/3 AD- 719 239

ARMY ELECTRONICS COMMAND FORT MONMOUTH N

Low Power Methanol/Air Battery

3

Research and development technical DESCRIPTIVE NOTE:

Perry, John , Jr; rept..

NOV 70 24P Pt REPT, NO. ECOM-3365 PROJ: DA-1-T-662705-A-053

1-T-662705-A-05304

TASK:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, DESIGN), CARBINOLS, AIR, ELECTROLYTES, ELECTRODES, BATTERY SEPARATORS, PLATINUM, PALLADIUM, TEST METHODS, CATALYSTS,

IDENTIFIERS: \*METHANOL AIR BATTERY CELLS MERCURY

33

3 using KOH electrolyte at room temperature (21C), show that current densities of 15 m A/sq cm at 0.60 V can be obtained. Single cells operated for more than 400 hours at current densities of 10 to 12 mA/sq cm constant current (0.67 to cathode with faradaic reactant efficiencies as high without a membrane or separator protection for the electrolyte capacities to operate for more than 40 hours on a single filling. The cells operated Investigations of methanol/air battery cells, as 60% during a cycle. The anode electrode contained a Pt:Pd catalyst and the cathode 0.80 A). These small cells had reactantelectrode, a silver catalyst. (Author)

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AD- 719 239

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SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

0- 718 833 10/2 10/3 OFFICE OF NAVAL RESEARCH LONDON (ENGLAND) AD- 718 833

International Power Sources Symposium (7th) Held in Brighton, Sussex on 15-17 September 1970.

3

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION

UNCLASSIFIED

DOC REPORT BIBLIDGRAPHY

AD- 718 854

DEPT

Evaluation Program for Secondary Spacecraft

Cells.

DESCRIPTIVE NOTE: Annual rept. no.

QE/C-71-1

3

Banos, Alfredo , Jr; DESCRIPTIVE NOTE: Conference rept., REPT. NO. ONRL-C-1-71 111

UNCLASSIFIED REPORT

3

Flight Center.

DESCRIPTORS: (\*STORAGE BATTERIES,
RELIABILITY(ELECTRONICS)), TEST METHODS, SPACECRAFT
COMPONENTS, CADMIUM, NICKEL, SILVER, ZINC
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, \*CADMIUM
CELLS, \*SILVER CADMIUM CELLS, \*SILVER ZINC BATTERY
CELLS

Sponsored in part by National Aeronautics and Space

SUPPLEMENTARY NOTE: Report on Cycle Lift Test.

UNCLASSIFIED REPORT

3

6 institution, and (c) the subject matter itself, The report gives an analysis of the nations represented, and a full account of the papers according to: (a) nature of the paper, whether research, development, production and testing, applications; (b) the type of contributing

DESCRIPTORS: (\*BATTERY COMPONENTS, SYMPOSIA), FUEL CELLS, SOLAR CELLS, ELECTRODES, ELECTROLYTES, IRON, LITHIUM, NICKEL, PLATINUM, SILVER, LEAD(METAL), ZINC, GREAT BRITAIN
IDENTIFIERS: ZINC AIR BATTERY CELLS, LEAD ACID BATTERIES, MICKEL CADMIUM BATTERIES

3 3

and concludes with general remarks on the highlights of meeting. The appendix contains a complete list of the papers presented. (Author)

3

The report covers the cycle life test, the third phase of the evaluation program of secondary spacecraft cells. The cells tested are nickel-cadmium, silver-zinc, and silver-cadmium.

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

HONEYWELL INC MONTGOMERYVILLE PA LIVINGSTON ELECTRONIC

3 Design of Liquid Ammonia Battery

DESCRIPTIVE NOTE: Summary rept.,
JUL 70 84P Backlund, J. R.;
CONTRACT: DA-28-017-AMC-1542(A)

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*PRIMARY BATTERIES, DESIGN), AMMONIA, LIQUEFIED GASES, ELECTRODES, BATTERY COMPONENTS, ELECTRIC BATTERIES

IDENTIFIERS: \*LIQUID AMMONIA, \*AMMONIA ACTIVATED BATTERIES, \*RESERVE BATTERIES

3 delivering eight voltage levels at various currents for a period of 50 hours at -65F to +160F.

Efforts consisted principally of packaging of existing liquid ammonia chemistry in an advanced mechanical configuration. Major innovations in design were yielded in the form of activation were met by the resultant design except for voltage regulation at each output tap for the entire The report summarizes work done in the design of a satisfying the particular requirements of one application which include 24-volt multitap output primary reserve liquid ammonia battery capable of electrical leakage. All technical specifications mechanics and the minimization of intercell discharge period. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

TYCO LABS INC WALTHAM MASS AD- 718 109

Purification and Analysis of Organic Nonaqueous Solvents.

3

DEC 70 247P Butler, James N.; Jasinski, Raymond J.; Cogley, David R.; Jones, H. Lloyd Final rept. 1 Oct 67-30 Sep 70, DESCRIPTIVE NOTE:

Synnott, John C. ;

REPT. NO. C-742 CONTRACT: F19628-68-C-0052 PROJ: AF-8659 TASK: 865904

MONITOR: AFCRL

## UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*ORGANIC SOLVENTS, PURIFICATION),
(\*BATTERY COMPONENTS, ORGANIC SOLVENTS), CHEMICAL
ANALYSIS, ACETONITRILE, FORMAMIDES, SULFOXIDES,
LACTONES, AMIDES, PHOSPHORUS COMPOUNDS, FURANS, GAS
CHROMATOGRAPHY, INFRARED SPECTRA, ULTRAVIOLET SPECTRA,
VISIBLE SPECTRA, POLAROGRAPHIC ANALYSIS, LITHIUM
COMPOUNDS, WATER, (U)WATER
IDENTIFIERS: \*LITHIUM CELLS, NONAQUEOUS ELECTROLYTES,
\*ORGANIC BATTERIES, \*BATTERY ELECTROLYTES,
BUTYROLAC: JNE, PROPYLEME CARBONATE, PYRROLIDONE/NMETHYL-2, FORMAMIDE/DIMETHYL, FURAN/TETRAHYDRO, HEMPA

3

In order to make possible a rigorous program of research and development of high energy battery systems based on aprotic organic electrolytes and lithium anodes, a literature survey and a number of experimental studies have been conducted on the purification and analysis of relevant solvents: acetonitrile, butyrolactone, dimethyl sulfoxide, dimethyl formamide, formamide, hexamethyl phosphoramide, N-methyl pyrrolidone, propylene carbonate, and tetrahydrofuran. In all cases, 10 ppm water or organic impurities, and for analysis methods have been developed (where not already available) for purification to a level of less than of the solvents at that purity level. Stability of lithium electrodes, has been examined critically. the pure solvents, particularly in contact with

AD- 718 109

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 717 950 13/10 10/2
MASSACHUSETTS UNIV AMHERST SCHOOL OF ENGINEERING

Some Deep Sea Vehicle Personnel Hulls and Energy Storage Subsystems,

3

NOV 70 95P Heronemus, William E.; Kidd, George R.; REPT. NO. THEMIS-UM-70-7 CONTRACT: NO0014-68-A-0146 PROJ: NR-200-016

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*HULLS(MARINE), DEEP SUBMERGENCE),
(\*STORAGE BATTERIES, \*UNDERWATER VEHICLES), STEEL,
LEAD(METAL), SILVER, ZINC
IDENTIFIERS: ZINC CELLS, LEAD ACID BATTERIES, SILVER
ZINC BATTERY CELLS
(U)

More operators to 20,000 foot depths are analyzed to measure operator comfort and utility index against weight, displacement, shape, dimensions and cost. Emphasis is placed on steel hull materials.

Twenty-four diff.ent configurations of either lead-acid or silver-zinc energy storage batteries are analyzed. Competitive concepts for each of these major subsystems of the deep sea vehicle are compared against each other at the subsystem level.

They are compared again after integration into complete deep sea vehicles. (Author)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 717 497 10/3 AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB OHIO

Zinc-Silver Oxide Batteries,

3

71 574P Fleischer, Arthur ; Lander,

### UNCLASSIFIED REPORT

Availability: Paper copy available from John Wiley and Sons, Inc., New York, N. Y. \$27.95.
No copies furnished by DDC or NIIS.
SUPPLEMENTARY NOTE: Report on a Volume in the Electrochemical Society Series.
DESCRIPTORS: (\*ALKALINE BATTERIES, REVIEWS), (\*STORAGE BATTERIES), (\*SILVER, STORAGE BATTERIES), ORY BATTERIES), (\*SILVER, STORAGE BATTERIES), DRY BATTERIES, MANUFACTURING, BATTERY SEPARATORS, DESIGN, REACTION KINETICS

\*\*SILVER: \*\*ZINC CELLS, SILVER OXIDES, \*\*SILVER ZINC BATTERY CELLS

Contents: Zinc electrode, fundamental chemistry and electrochemistry; Silver electrode, fundamental chemistry and electrochemistry: Manufacture of electrodes; Separators; Cell and battery design features; Applications of Zinc-silver oxide batteries; and Battery use, procurement, quality (U)

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

JOHNS HOPKINS UNIV SILVER SPRING MD APPLIED PHYSICS 22/2 AD- 716 771

Design and Test of the SAS-A Power System

3

echnical memo., P Sullivan, Ralph M. MAY 70 155P NO. APL-TG-1106 NOW-62-0604 DESCRIPTIVE NOTE:

347.95.00.00-56-32

GIDEP

## UNCLASSIFIED REPORT

DESCRIPTORS: (\*POWER EQUIPMENT, \*SCIENTIFIC SATELLITES), SOLAR PANELS, ALKALINE BATTERIES, STORAGE BATTERIES, VOLTAGE REGULATORS, CONTROL SYSTEMS (U) 3 SATELLITES

array, a rechargeable nickel-cadmium battery, and two redundant charge control systems. The unique feature of this system is that there are a wide range of battery currents from the solar array, compilicating the task of the charge control elements. The first part of the report describes the design of the power system with emphasis on the predicted and of allowing more a curate predictions of the heat redundant charge control elements is made to show the accommodating changes in the battery characteristics solar cell array currents for different positions of the satellite with respect to the sun. The second part of the report presents the results of the power being simple and lightweight. However, the heavier advantages and disadvantages of each. A battery current and voltage limiter has the advantage of system test. Curves describing system operation are presented. A comparison between the two electronic coulometer has the advantage of dissipated in the battery. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMD7 DDC REPORT BIBLIDGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AD- 715 803

Evaluation of Storage Methods, Open Circuit Versus Continuous Trickle Charge, Sonotone 3.5 Ampere-Hour Sealed Nickel-Cadmium Secondary Spacecraft Cells,

3

Thomas, R. E. REPT. NO. QE/C-70-808

### UNCLASSIFIED REPORT

Report on Evaluation program for Secondary Spacecraft Ceils.
DESCRIPTORS: (\*STORAGE BATTERIES, SPACECRAFT), (\*ALKALINE BATTERIES, STORAGE), RELIABILITY(ELECTRONICS), NICKEL, CADMIUM, SUPPLEMENTARY NOTE:

IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, ACCEPTABILITY EVALUATION

3 3

compare, after each successive 1-year storage period, the discharge and charge characteristics of charged cells on open circuit versus that of cells on continuous trickel charge. Following completion of each year of storage, the cells were subjected to the lower capacity of each storage method for analysis at cells were rejected or removed from the storage test on the basis of this testing sequence. These tests, reporting the condition of the cells as the test continues and aids in the selection of a cell of after each year of storage, serve as a means of standard acceptance test sequence. However, no The specific purpose of the 5-year test is to

AD- 715 803

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fourth 1-year storage period is contained in this report accompanied by summaries and data accumulated from the start of the storage testing. (Author)

the end of each yearly storage period. Data of the acceptance test sequence following completion of the

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

EAGLE-PICHER CO JOPLIN MO COUPLES DEPT 10/3 AD- 714 243

Sealed Nickel-Cadmium Battery Assembly BB-655()/U.

3

DESCRIPTIVE NOTE: Rept. no. 1 (Final), 1 Jun 69-30 Gordon, Dale ; PROJ: DA-1-H-664710-D-535-01 CONTRACT: DAAB07-69-C-0406 ECOM 0406-F 64P 20 MONITOR: SEP

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, RELIABILITY(ELECTRONICS)), (\*STORAGE BATTERIES, DESIGN), BATTERY COMPONENTS, ELECTRIC BATTERIES, MECHANICAL PROPERTIES, THERMAL PROPERTIES, ELECTRICAL PROPERTIES(U) IDENTIFIERS: NICKEL CADMIUM BATTERIES (U)

development and testing of the nickel-codmium battery assembly BB-655()/U. This battery assembly is a military-ruggedized design consisting of 20 series-connected 'F' cells assembled between two (2) fiberglass circuit boards and restrained with a rigid epoxy potting. The battery assembly is rated at 24 volts and 7.0 ampere-hours or 12 volts and 14 ampere-hours. This multiple voltage arrangement is possible as a result of the USAECOM connector arrangement. Fifty-nine (59) battery assemblies were constructed and 16 were successfully tested to 3 environmental and electrical testing. The environmental tests included vibration, bounce and four foot (4') drop testing of all corners, faces and edges with cover and simulated equipment. This Final Report outlines the design and development program and fully documents the battery assembly design. Complete drawings to USAECOM format are Artist's Visualization of the battery assembly. The purpose of the contract was the design, ncluded in the Final Report as well as Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AD- 713 457 DEPT ANALYSIS AND EVALUATION OF SPACECRAFT BATTERY ACCELERATED LIFE TEST DATA.

3

REPT. NO. QE/C-70-687

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE BATTERIES, ACCELERATED TESTING), (\*ALKALINE BATTERIES, ACCELERATED TESTING), STATISTICAL ANALYSIS, FAILURE(ELECTRONICS), NICKEL, CADMIUM, RELIABILITY(ELECTRONICS), LIFE EXPECTANCY IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, \*SPACECRAFT

3

3 The report presents the findings from the mathematical/statistical analysis of data generated from the accelerated life test on 40 nickel-cadmium spacecraft battery cells. Two major objectives of the analysis were to: (1) determine the applicability and reliability of the previously developed cell life prediction model when applied to an accelerated life situation and (2) attempt to make alterations in the prediction model which would Results of the analysis, based on eight failures to date, indicate: (1) about 75% accuracy in predicting the useful life of a cell with the original prediction model and (2) the application of Bayesian analysis techniques yields the same accuracy, but enables the model to be formally used make it more conducive to accelerated life testing. in the absence of historical data. (Author)

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

NICKEL-CADMIUM BATTERIES,

3

AUG 70 8P Tenkovtsev,V.;Levi,M. Drachev,G.; TD-413-70 PRDJ: FTD-6040102 TASK: DIA-169-04-9

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Edited trans. of Radio, Moscow (USSR) n6 p57-59 1968, by H. Peck.
DESCRIPTORS: (\*SIORAGE BATTERIES, \*CADMIUM), ELECTRODES, NICKEL, BATTERY COMPONENTS, ELECTRIC BATTERIES, (U) MANUFACTURING, USSR (U) TRANSLATIONS \*NICKEL CADMIUM BATTERIES, CADMIUM CELLS, TRANSLATIONS

A brief summary on miniature (capacity = or < 1.5 A/H) nickel cadmium batteries is given. (U)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 711 847 10/3 NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION DEPT EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS.
ACCEPTANCE TEST OF SONOTONE CORPORATION 20
AMPERE-HOUR NICKEL-CADMIUM CELLS,

AUG '0 20P Harkness.J. D. REPT. NO. QE/C-70-691 PROJ: NASA-PO-W12397

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, \*ALKALINE BATTERIES),
ACCEPTABILITY, NICKEL, CADMIUM, SPACEBORNE,
RELIABILITY(ELECTRONICS), PRESSURE
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, \*SPACECRAFT
ELECTRIC POWER UNITS
(U)

The goal was to study the effect of mechanical pressure on the cell plates of nickel-cadmium cells. (U)

SEARCH CONTROL NO. ZOMO? DOC REPORT BIBLIDGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AD- 711 595

3 EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS.
ACCEPTANCE TEST OF GULTON INDUSTRIES, INC. AND
GENERAL ELECTRIC COMPANY 6.0 AMPERE-HOUR NICKELCADMIUM CELLS,

Christy, D. E. REPT. NO. QE/C-70-690

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, ACCEPTABILITY), (\*SPACECRAFT COMPONENTS, STORAGE BATTERIES), LEAKAGE(FLUID), RELIABILITY(ELECTRONICS), CADMIUM. NICKEL
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

Ë electrical and environmental conditions is discussed as is cell weaknesses, including causes of failure of and limitations, including cycle life under various cells, The object of the evaluation program was to gather information concerning secondary spacecraft cells, general. More specifically, these cells are being evaluated for their use in the SAS program. Information concerning performance characteristics present designs. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AD- 711 594 DEPT EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS. ACCEPTANCE TESTS OF GULTON INDUSTRIES 6.0 AMPEREMON NICKEL-CADMIUM CELLS WITH GULTON PLATES,

3

Christy, D. E. REPT. NO. QE/C-70-662

### UNCLASSIFIED REPORT

LEAKAGE (FLUID), RELIABILITY (ELECTRONICS), CADMIUM DESCRIPTORS: (\*STORAGE BATTERIES, ACCEPTABILITY), (\*SPACECRAFT COMPONENTS, STORAGE BATTERIES), NICKEL

IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

33

33

3 The purpose of the acceptance test program was to insure that all cells put into the life cycle program are of high quality by the removal of cells found to have electrolyte leakage, internal shorts, low capacity, or inability of any cell to recover its open circuit voltage above 1.15 after the cell short test. (Author)

AD- 711 594

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION AD- 711 592

EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS. SYNCHRONOUS ORBIT TESTING OF GENERAL ELECTRIC COMPANY 6.0 AMPERE-HOUR NICKEL-CADMIUM CELLS,

Christy, D. E. REPT. NO. QE/C-70-634

### UNCLASSIFIED REPORT

33 ESCRIPTORS: (\*STORAGE BATTERIES, SPACE ENVIRONMENTS), (\*SPACECRAFT COMPONENTS, STORAGE BATTERIES), TEMPERATURE, COLD WEATHER TESTS, NICKEL, CADMIUM, RELIABILITY(ELECTRONICS)
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES DESCRIPTORS:

in the document to gather performance information concerning sealed nickel-cadmium cells operating under a synchronous orbit regime. Such a regime simulates a space satellite maintaining a position over a fixed point on earth as the earth rotates on its axis and revolves about the sun. The purpose of the eva Jation program was reported Author)

3

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N AD- 711 521

FEASIBILITY STUDY OF THE LITHIUM/C(x)F PRIMARY

3

Technical rept. Oct 68-May 70 Braeuer, Klaus ; DESCRIPTIVE NOTE:

AUG 70 81P Br REPT. NO. ECOM-3322 PROJ: DA-1-T-662705-A-053 1-T-362705-A-05302 TASK:

3

### UNCLASSIFIED REPORT

3  $\widehat{\boldsymbol{\varepsilon}}$ DESCRIPTORS: (\*PRIMARY BATTERIES, \*LITHIUM), (\*ELECTRODES, \*GRAPHITE), FLUORIDES, ELECTROLYTES, FEASIBILITY STUDIES, RELIABILITY(ELECTRONICS), ELECTROCHEMISTRY, COSTS, MANUFACTURING, HYDROXIDES IDENTIFIERS: \*LITHIUM CELLS, ELECTROLYTES, FUSED SALTS, \*ORGANIC BATTERIES, HIGH ENERGY BATTERIES

C(x)F, has been proposed as a cathode material for an organic electrolyte primary cell to achieve, A graphite-fluorine intercalation compound,

organic electrolyte solutions. C(x)F was synthesized by fluorination of graphite and the crude simultaneously, high energy density during operation and long shelf-life during storage in the activated state. In a investigation was carried out to determine if the concept of a lithium/C(x)F-cell is feasible by studying the chemical and compound treated in several different ways to remove volatile or soluble impurities. Samples of C(x)F were brought into equilibrium with the electrolytes electrodes were prepared. The open circuit potentials, steady-state potentials, operating voltages, currents, and ampere-hours of C(x)F-cathodes and Li/C(x)F-cells were measured electrochemical reactions of C(x)F in various and the amounts of H(+), Fe(3+) and F(-) generated by non-electrochemical processes analytically determined. Porous C(x)F

AD- 711 521

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energy density, rate capability, shelf life and cost

qualitatively determined in cathode mixes by X-ray

Potentiostatic conditions. Reaction products were diffraction analysis. The capacity, cell voltage, of Li/C(x)F-cells have been compared with those of other lithium eventant

during discharge under galvanostatic and

AD- 711 592

other lithium systems

ZOMOZ

3

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 710 952

ENGINEERING EVALUATION OF LOW TEMPERATURE HIGH RATE RESERVE MAGNESIUM PERCHLORATE BATTERIES.

Almerini, Achille L.; DESCRIPTIVE NOTE: Technical rept., 27P JUL 70

Nordell, Carl A.

REPT. NO. ECOM-3307 PROJ: DA-1-T-662705-A-053

1-T-662705-A-05302 FASK:

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*PRIMARY BATTERIES, \*MAGNESIUM),
(\*ELECTROLYTES, \*FERCHLORATES), (\*WATER ACTIVATED
BATTERIES, MAGNESIUM), DESIGN, MANGANESE COMPOUNDS,
MERCURY COMPOUNDS, COLD WEATHER TESTS,
RELIABILITY(ELECTRONICS)
IDENTIFIERS: \*MAGNESIUM CELLS, \*MAGNESIUM MANGANESE
DIOXIDE CELLS, \*RESERVE PATTERIES

3

3 An engineering evaluation program successfully demonstrated the feasibility of magnesium perchlorate electrolyte batteries in meeting high rate and low construction features and to optimize such critical both manganese dioxide or mercuric oxide batteries temperature requirements of telemetry systems in Army warheads. More effort is needed, however, to were satisfactory, the former show more favorable achieve a single battery design and electrolyte formulation that will work over the entire temperature range of -40F to +140F. While voltage characteristics. Further design work is recommended to achieve optimum cell and battery factors as electrolyte formulation, volume and methods for fast and uniform activation. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/3 AD- 710 951

STANDARD FAMILY OF POWER SOURCES.

3

DESCRIPTIVE NOTE: Technical rept.,

Linden, David ; Pilla, Louis 32P JUL 70

REPT. NO. ECOM-3306 PROJ: DA-1-T-662705-A-053

1-T-662705-A-05302 PROJ: TASK:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, STANDARDIZATION), STORAGE BATTERIES, PRIMARY BATTERIES, FUEL CELLS, BATTERY CHARGERS, (U)BATTERY CHARGERS IDENTIFIERS: METAL AIR CELLS, RESERVE BATTERIES, THERMOELECTRIC POWER GENERATION

3 3

with hardware that only could be used in a single application and provide the user with a family of power sources from which he could select one suitable to meet the needs of his equipment. This standard family incorporates the use of standard output voltages (6/12/24 volts), a standard connector cells, thermal energy generators, and power supplies being developed as part of the standard family, is developed for each equipment; rather, the selection which will minimize the number and variety of power of a battery is based on the mission requirement. A sources, prevent the flooding of the supply system standard dimensions which provide physical interchangeability. The use of the standard family achieves a new concept in the deployment of power list of power sources, including batteries, fuel which provides electric interchangeability and A standard family of power sources is proposed Sources. No longer is a single power source included in the report. (Author)

AD- 710 951

3

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

AMERICAN CYANAMID CO STAMFORD CONN STAMFORD RESEARCH AD- 709 633

3 SIX-POUND WATER ACTIVATED ZINC-AIR STANDARD LINE BATTERY BA-535()/U.

rinal rept., P Smith, Raymond J. D. DAAB07-69-C-0276 PROJ: DA-1-T-662705-A-053 I-T-662705-A-05302 ECOM 0276-F 99P DESCRIPTIVE NOTE: CONTRACT: DAAR MONITOR:

### UNCLASSIFIED REPORT

3  $\Xi$ DESCRIPTORS: (\*WATER ACTIVATED BATTERIES, ZINC), (\*STORAGE BATTERIES, WATER ACTIVATED BATTERIES), AIR, DESIGN, RELIABILITY(ELECTRONICS), HYDROXIDES, TEST IDENTIFIERS: \*ZINC AIR BATTERY CELLS, \*METAL AIR CELLS, \*RESERVE BATTERIĘS

3 hour zincair batteries were fabricated, of which eleven were supplied impregnated with potassium hydroxide for water activation and nine were supplied without KOH impregnation but with 34% aqueous KOH electrolyte separately packed. Acceptance testing of the battery at 75F, 40% R.H. was successfully carried out, the sample selected Twenty six-pound water activated 24 volt 20 ampereyielding 24.2 A-h, or a power density of 84 watt hrs/lb. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) BATTERY DESIGN FOR AEROSPACE POWER SUPPLIES, AD- 709 273

3

Lackner, J. L. ;King, T. E. : Haines, R. L. ; REPT. NO. DRED-592

### UNCLASSIFIED REPORT

Space Jnl., v15 v10 p393-398 Dec. 69. No copies Availability: Pub. in Canadian Aeronautics and

Aerospace Technology Symposium held in Toronto (Ontario), 17 Mar 69.
DESCRIPTORS: (\*SATELLITES(ARTIFICIAL), POWER SUPPLIES), (\*STORAGE BATTERIES, DESIGN), THEORY, MANUFACTURING, SUPPLEMENTARY NOTE: Presented at the Advanced IDENTIFIERS: \*NICKEL CADMIUM BATTERIES NICKEL, CADMIUM, CANADA

33

system is reviewed with emphasis on the various problem areas and their solution. Methods to provide for the efficient and rapid recombination of gases evolved during prolonged overcharging over a range of temperatures, particularly low temperatures, are discussed. Experience with Alouettes I and ISIS 'A' satellite power supplies has material, correct positive to negative plate balance, production batteries. Particular reference is made shown that for aerospace applications there is a processing of plates during the early stages of manufacture, selection of electrolyte and to the definite need for improvement over the standard The basic theory of the sealed nickel-cadmium to the processing and selection of separator welding and sealing techniques employed. (Author)

3

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

DEFENCE RESEARCH ESTABLISHMENT OTTAWA (ONTARIO) AD- 709 272

THE SULFUR ELECTRODE,

3

Coleman, J. R.; Bates, M. REPT. NO. DREG-549

### UNCLASSIFIED REPORT

p289-302 1968. No copies furnished.
DESCRIPTORS: (\*SULFUR, \*ELECTRODES), (\*BATTERY COMPONENTS, SULFUR), CATHODES(ELECTROLYTIC CELL), ELECTROLYTES, SULFOXIDES, PERCHLORATES, SULFIDES, Availability: Pub. in Proceedings of the International Symposium on Power Sources (6th), DENTIFIERS: \*ORGANIC BATTERIES CANADA. (U)CANADA

3 nickel current collection, has been employed as the cathode in an organic electrolyte battery system with lithium as the anode. Of the electrolytes tried, dimethylsulfoxide-KClO4 and butyrolactoneof the sulfur was obtained to a cutoff voltage of 2.0 colored soluble polysulfides, which diffuse into the Sulfur, blended with graphite and compressed on a dimethylsulfoxide mixtures with KCl04 or KSCN proved the best. Utilization of up to 20 per cent V. The sulfur on partial reduction forms highly electrolyte and escape further reduction.

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/3 AD- 708 866

OXIDE SECONDARY BATTERY BB-534()/U (ENGINEERING HIGH ENERGY DENSITY, LONG LIFE, ZINC-SILVER EVALUATION).

3

DESCRIPTIVE NOTE: Research and development technical rept.,

Settembre, E. J.; JUN 70 21P SE REPT. NO. ECOM-3287 PROJ: DA-1-T-662705-A-053

TASK: 1-T-662705-A-05302

### UNCLASSIFIED REPORT

3 RELIABILITY(ELECTRONICS)), (\*ALKALINE BATTERIES, RELIABILITY(ELECTRONICS)), DESIGN, ZINC, SILVER COMPOUNDS, OXIDES
IDENTIFIERS: \*ZINC CELLS, \*SILVER ZINC BATTERY CELLS, (\*STORAGE BATTERIES, HIGH ENERGY BATTERIES DESCRIPTORS:

33

3

3 lightweight, rugged, standard manpacked case. The storage life of this battery is extended by shipping The physical and electrical characteristics for a high energy density zinc-silver oxide battery and battery assembly are presented. The BB-534()/ supplied in sealed plastic containers. Before use the battery is filled and charged. This battery has the capability of furnishing either 9.0 Ah at 24 volts, or 18.0 Ah at 12 volts and meets severe weight and volume of any battery assembly in the standard family of alkaline batteries. (Author) U consis,s of four (4) vented zinc-silver oxide requirements. Further, this battery assembly provides the greatest available energy per unit in the dry unactivated state. Electrolyte is BB-461()/U monobloc batteries housed in a electrical, environmental and mechanical

227

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 708 577 10/2 EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT HIGH-RATE MAGNESIUM/MANGANESE-DIOXIDE BATTERIES FOR FIELD APPLICATION FROM -40F TO 125F.

3

DESCRIPTIVE NOTE: Final rept. Apr 68-Apr 70,
MAY 70 59P Russell, Jerry L.;
CONTRACT: DAABO7-68-C-0228
PROJ: DA-1-T-622001-A-053, DA-1-T-662705-A-053
MONITOR: ECOM 0228-F

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, \*MAGNESIUM), (\*WATER ACTIVATED BATTERIES, MAGNESIUM), MAGNESIUM OXIDES, DESIGN, RELIABILITY(ELECTRONICS), ELECTROLYTES, MANGANESE COMPOUNDS, DIOXIDES

IDENTIFIERS: \*MAGNESIUM CELLS, \*RESERVE BATTERIES, (U)
HIGH ENERGY RATE BATTERIE?

The report describes the design, fabrication and testing of two d'fferent high-rate, high-energy density primary batteries employing a magnesium/magnesium-perchlorate/manganese-dioxide system. The batteries consist of the 4-pound BA-838()/U and the 6-pound BA-839()/U. The batteries are capable of supplying as high as 37 watt-hours/lb. for the BA-838()/U and 45 watt-hours/lb. for the BA-839()/U. Both batteries are capable of of operating from -40F to +125F and of surviving severe dynamics. An inexpensive activator mechanism is employed that makes possible a rapid simple means for simultaneously activating all 16 cells of the battery. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 707 192 10/3 NAVAL RESEARCH LAB WASHINGTON D C Pbo2 IN THE LEAD-ACID CELL. II. CYCLING AND OVERCHARGE ON PURE AND ANTIMONIAL LEAD GRIDS,

3

SEP 69 7P Burbank, Jeanne ; Ritchie, Everett u. ;

### UNCLASSIFIED REPORT

Availability: Pub. in Jnl. of the Electrochemical Society, v117 n3 p299-305 Mar 70. DESCRIPTORS: (\*STORAGE BATTERIES, ELECTRIC CURRENTS), LEAD(METAL), CHEMICAL PRECIPITATION, LEAD COMPOUNDS, DIOXIDES, CATALYSTS, ANTIMONY IDENTIFIERS: \*\*LEAD ACID BATTERIES, LEAD DXIDES, \*\*ELECTRIC CHARGE\*\*

3 3

Three representative lead oxides were used in fabricating lead-acid cells with pure and antimonial lead grids. The cells were cycled and overcharged. Positive plates were removed at intervals and the active material was examined by x-ray diffraction, electron microscopy, and by spectroscopy. Bulk densities of the active materials were also determined. The rate of loss in bulk density of the PbO2 was higher in the pure lead cells. This and the loss in capacity have been attributed to the grain growth and anhedralization that take place more rapidly when antimony is absent. Antimony appears to act as a nucleating catalyst for the PbO2 and inhibits crystal growth. (Author)

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

UTAH UNIV SALT LAKE CITY AD- 705 904

3 CURRENT OUTPUT OF SILVER OXIDE-ZINC AND MERCURY OXIDE-ZINC MINIATURE BATTERIES, THE EFFECT OF HIGH PRESSURE ON THE VOLTAGE AND

CONTRACT: DA-31-124-ARD(D)-408, DA-ARD(D)-31-124-JUL 69 10F Andersen,T. N.; Miner, B. A.; Ghandehari, M. H.; B.; J. R. J.; Eyring, G1110

PROJ: DA-2-0-061102-B-13-B MONITOR: ARDD 3383:18-C

### UNCLASSIFIED REPORT

Availability: Pub. in Unl. of the Electrochemical Society, vi16 n10 p1342-1347 Oct 69.

SUPPLEMENTARY NOTE: Sponsored in part by Grant NSF-GP-6496. Revision of report dated 14 Apr 69.

DESCRIPTORS: (\*ALKALINE BATTERIES, HIGH PRESSURE), (\*PRIMARY BATTERIES, HIGH PRESSURE), THERMODYNAMICS, OXIDES, ZINC, SILVER COMPOUNDS. MERCURY COMPOUNDS.

ZINC BATTERY CELLS, \*MERCURY ZINC CELLS, \*SILVER (U

3 batteries up to 20 kbars. The emf of these batteries varies with pressure in the manner expected based on the thermodynamics of the cell reactions. Pressure affects the voltage of the discharging silver oxide batteries only through its effect on the The open circuit voltage (emf) and the voltage under load of a!kaline silver-oxide-zinc and mercuric oxide-zinc miniature batteries have been measured at emf. The voltage of the discharging mercuric oxide battery is lowered with increasing pressure by approximately 5 mV/kbar. This decrease in voltage is due both to an increase in the over-voltage at the water channels in the reduced oxide and the influence of these channels on the number of oxide sites at the postulated diffusion of hydroxyl ions through These pressure effects are discussed in terms of HgO electrode and also to the ohmic resistance. which reduction may occur. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

7 ARMY ELECTRONICS COMMAND FORT MONMOUTH N

3 COMPOUNDS INVOLVED IN THE ELECTROCHEMICAL REDUCTION OF M-DINITROBENZENE. SYNTHESIS AND CHARACTERIZATION OF INTERMEDIATE

Walbrick, Johnny M. DESCRIPTIVE NOTE: Technical rept.,

REPT. NO. ECOM-3222 PROJ: DA-1-T-061102-A-34-A TASK: 1-T-061102-A-34-A02

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*NITROBENZENES, \*ELECTROCHEMISTRY),
(\*REDUCTION(CHEMISTRY), NITROBENZENES), NITROSO
COMPOUNDS, CATHODES(ELECTROLYTIC CELL), ELECTROLYTES, IDENTIFIERS: \*NITRO COMPOUNDS, \*ORGANIC BATTERIES, ORGANIC BATTERIES, ANILINE, AZOXY COMPOUNDS, AZO COMPOUNDS, PHENYLENEDIAMINES PRIMARY BATTERIES

3

3 m-dinitrobenzene is discussed, with special attention being placed upon the pH dependence of the reduction. The synthesis and characterization of several of the intermediate compounds involved in the m-nitronitrosobenzene, m-nitrophenylhydroxylamine, m-nitroaniline, m,m'-dinitroazoxybenzene, m,m'-The mechanism for the electrochemical reduction of Compounds included in this were m-dinitrobenzene, postulated reaction sequence are described. dinitroazobenzene, and m-phenylenediamine. (Author)

AD- 705 904

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 701 878

POWER SUPPLY SET AN/GSQ-152() (ENGINEERING EVALUATION).

3

Pilla, Louis J. DESCRIPTIVE NOTE: Technical rept., REPT. NO. ECOM-3219 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-A-05301

### UNCLASSIFIED REPORT

Ξ DESCRIPTORS: (\*POWER SUPPLIES, \*SEARCH RADAR), PORTABLE EQUIPMENT, GENERATORS, THERMOELECTRICITY, INVERTERS, ALKALINE BATTERIES, NICKEL, CADMIUM, COMBAT SURVEILLANCE

3 IDENTIFIERS: NICKEL CADMIUM BATTERIES, AN/TPS-33, \*THERMOELECTRIC POWER GENERATION

Power Supply Set is a thermoelectric generator operating in parallel with a 5.5 Ah nickel cadmium battery. The combined DC output is in turn fed to a static 115 V, 400 Hz inverter positioned atop the battery. The output results in either 28 V DC at 20 amperes or 115 V AC at 420 watts, or a combination of both, at a power level which does not exceed the limitations of the primary power source. A new static AC/DC portable military power source providing either 115 V, 400 Hz, AC or 28 V DC, or a combination of both, is described. The primary power source for the AN/GSQ-152( ) (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

CALIFORNIA UNIV LOS ANGELES SCHOOL OF ENGINEERING AND APPLIED SCIENCE 10/3 AD- 701 411

3 NONAQUEDUS ELECTROLYTE STUDIES FOR HIGH ENERGY BATTERIES.

: Final rept. 14 Jul 66-13 Oct 68 Bennon, Douglas N.; CONTRACT: N123(62738)57439A DESCRIPTIVE NOTE: 69

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, \*ELECTROLYTES), NITROBENZENES, REDUCTION(CHEMISTRY), SULFOXIDES, AMMONIA, LITHIUM, SULFITES, CARBONATES, GRAPHITE, (U)GRAPHITE

DENTIFIERS: NONAQUEOUS ELECTROLYTES, \*ORGANIC BATTERIES, \*BENZENE/DINITRO IDENTIFIERS:

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3 electrochemical reduction of meta-dinitrobenzene in dimethyl sulfoxioe and in liquid ammonia solutions. Also mentioned is research pertaining to electrochemical cells with relatively high potential formed using a lithium negative and graphite positive in dimentnyl sulfite and propylene carbonate solutions. It was believed that the positive electrode reaction involves the formation of a lamellar compound of graphite with the electrolyte A very brief summary is given work on the anion.

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AD- 701 878

AD- 701 411

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

AD- 700 994 10/3 HARRY DIAMOND LABS WASHINGTON D C

PLASTIC AMPOULE,

REPT. NO. HDL-TR-1471 PROJ: DA-1-B-262301-A-300, HDL-96300 Boyd, John M. 28P

### UNCLASSIFIED REPORT

3 3 IDENTIFIERS: POLYPROPYLENE, RESERVE BATTERIES, FILLED THERMOPLASTICS MESCRIPTORS: (\*CONTAINERS, \*ELECTROLYTES), (\*PRIMARY BATTERIES, CONTAINERS), ELECTROPLATING, DESIGN, TEST DESCRIPTORS:

3 A study was made of the feasibility of a plastic ampoule for use in a reserve battery. Containers were thermoformed from thermoplastic sheet stock and Future work will be directed toward an attempt to plate these ampoules made from a pigment- filled lower th the permeability and to design plastic ampoules for the PS-117 and the other small fuze polypropylene exhibited the lowest permeability. filled with electrolyte. which was completely encapsulated by heat-sealing a plastic disc container. Convetional techniques were used to power supplies. (Author, modified-PL)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 700 959

ENGINEERING EVALUATION OF ZINC-SILVER OXIDE BATTERY BB-622B/U USED WITH RADAR SET AN/PPS-

3

DESCRIPTIVE NOTE: Technical rept., JAN '0 37P SE REPT, NO. ECOM-3213 PROJ: DA-1-T-662705-A-053 1-T-662705-A-05302 TASK:

### UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*ALKALINE BATTERIES, RELIABILITY(ELECTRONICS)), RADAR EQUIPMENT, PORTABLE EQUIPMENT, POWER SUPPLIES, STORAGE BATTERIES, LIFE EXPECTANCY IDENTIFIERS: AN/PPS-5, SILVER ZINC BATTERY CELLS DESCRIPTORS:

BB-622/A was improved in two generations and the improved battery evaluated over a range of conditions to establish capacity, cycle life and environmental qualities. This evaluation was conducted by A long life, high energy density, zinc-silver oxide battery, capable of high power output, was developed to meet the demand for a lightweight high power source for use with Radar Set AN/PPS-5. threefold increase in cycle life at room temperature amounts of electrolyte in sealed plastic containers. Before use, they are filled and charged. The unactivated State and are supplied with premeasured Batteries capable of one year activated shelf stand original battery and the improved BB-522/A show a and one one-hundred (plus) life cycles are now attainable. These batteries are shipped in the and a twofold gain at 113F for the improved battery. The present BB-622B/U in a monoblock structure results in a battery of requirements. Comparative test data of the Simulating the Radar Set AN/PPS-5

AD- 700 959

3

approximately thirty percent greater capacity in the

same volume. Cost data on a per cycle basis and watthour basis are presented for the commercial

product and the improved BB-622B/U.

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO?

10/3 TYCO LABS INC WALTHAM MASS

3 STUDY OF THE COMPOSITION OF NONAQUEDUS SOLUTIONS OF POTENTIAL USE IN HIGH ENERGY DENSITY BATTERIES.

DESCRIPTIVE NOTE: Final rept. 1 Sep 66-31 Aug 69, SEP 69 304; Butler, James N.; Cogley, David R.; Synnott, John C.; Holleck, Gerhard; . C-648 PROJ: AF-8659 TASK: 865904

### UNCLASSIFIED REPORT

69-0410

MONITOR: AFCRL

3 DESCRIPTORS: (\*ELECTROCHEMISTRY, \*ORGANIC SOLVENTS), (\*BATTERY COMPONENTS, \*ELECTROLYTES), ELECTRODES, FORMAMIDES, SULFOXIDES, NUCLEAR MAGNETIC RESONANCE, PERCHLORATES, LITHIUM COMPOUNDS, CHLORIDES, MERCURY ALLOYS, SILVER COMPOUNDS, SOLUBILITY, COMPUTER PROGRAMS, (U)COMPUTER PROGRAMS IDENTIFIERS: \*BATTERY ELECTROLYTES, CYCLOPROPYLENE
CARBONATE, DMF(FORMAMIDE/DIMETHYL), DMSO(SULFOXIDE/
DIMETHYL), FORMAMIDE/DIMETHYL, \*HIGH ENERGY BATTERIES,
LITHIUM PERCHLORATE, \*LITHIUM CHLORIDE, \*ORGANIC
BATTERIES, PC PROPYLENE CARBONATE), PHOSPHATE/
HEXAFLUORO=FLUOPHOSPHATES, PHOSPHOROFLUORIDATES=
FLUOPHOSPHORIC ACID DERIVATIVES, \*PROPYLENE
CARBONATES, SILVER CHLORIDE, \*SULFOXIDE/O

electrode systems, and a specific experimental review of chloride reversible electrodes based on silver, in detail, and their relation to solvation phenomena solution thermodynamics of lithium chloride in these solvents. The solubility and complex formation equilibria of silver halides have also been studied thallium, lead, and cadmium. Detailed measurements have been made of the activity coefficients and battery electrolytes and cathode materials in the aprotic organic solvents propylene carbonate (PC), dimethyl formamide (DMF), and dimethyl sulfoxide (DMSD). These studies have included a comprehensive survey of reversible reference solution thermodynamics of potential high energy Electrochemical studies have been made of the s discussed.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J ELECTRONIC COMPONENTS LAB AD- 699 447

(a) LIGHTWEIGHT, DISPOSABLE WATER-ACTIVATED ZINC-AIR BATTERY: SESSION ON ZINC-AIR BATTERIES,

Wilburn, Nicholas T. ; 5P 69

UNCLASSIFIED REPORT

3 Power Sources Conference, 5p, 20-22 May 69.
DESCRIPTORS: (\*WATER ACTIVATED BATTERIES, \*ZINC),
PRIMARY BATTERIES, AIR, DESIGN, PORTABLE EQUIPMENT
IDENTIFIERS: \*METAL AIR BATTERIES, \*ZINC AIR BATTERY Availability: Pub. in Annual Proceedings (23rd)

3

3 non-reserve zinc-air system will be the best approach to meeting these requirements in the long range. The best current approach is the 60 to 80 watt-hour equipment require a low cost expendable power source of high energy density, high rate performance capability and efficient intermittent operation throughout the fairly wide temperature range. The per pound water activated zinc-air battery which is well within the current technology. A conceptually correct design of such a battery, in four and six bound modules, has been established. (Author) The demands of modern manpack communications

AD- 699 447

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ZOMOZ

- 699 440 10/3 13/8 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J ELECTRONIC ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY COMPONENTS LAB AD- 699 440

HIGH QUALITY ZINC ANDDES,

3

Sague, David M. ; Linden, David :

### UNCLASSIFIED REPORT

Availability: Pub. in Annual Proceedings (23rd)
Power Sources Conference, 5 p. 20-22 May 69.
DESCRIPTORS: (\*ANGDES(ELECTROLYTIC CELL), \*ZINC),
(\*QUALITY CONTROL, ANGDES(ELECTROLYTIC CELL)), STORAGE
BATTERIES, AIR
IDENTIFIERS: \*METAL AIR BATTERIES, \*ZINC AIR BATTERY

3 The report discusses the effectiveness of the quality control and quality assurance procedures in attaining the goals of nigh quality and low

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N AD- 699 437

ADVANCED PRIMARY ZINC-AIR BATTERIES,

3

Knapp, H. R. ; Nordell, C. **SP** A. : Linden, D. ;

### UNCLASSIFIED REPORT

Availability: Pub. in Annual Proceedings (23rd), Power Sources Conference, 5p, 20-22 May

3 DESCRIPTORS: (\*PRIMARY BATTERIES, \*ALKALINE BATTERIES), DESIGN, ZINC, AIR, TEST METHODS IDENTIFIERS: \*METAL AIR CELLS, \*ZINC AIR BATTERY

tested and the capability of the zinc-air battery to meet the design objectives, both electrical and mechanically rechargeable zinc-air batteries ranging in capacity from 20 Ah to 150 Ah. The design details of these five batteries are given. environmental, has been demonstrated. The studies have resulted in the design of five standard line Batteries and components have been fabricated and

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UNCLASSIFIED

AD- 699 437

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

ND- 699 436 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J MILITARY MAGNESIUM BATTERIES,

69 5P Legath, Alfred J. :Wood,

## UNCLASSIFIED REPORT

Availability: Pub. in Annual Proceedings (23rd)
Power Sources Conference. 5p 20-22 May 69.
DESCRIPTORS: (\*PRIMARY BATTERIES, DRY BATTERIES), (\*DRY BATTERIES, MAGNESIUM), MANGANESE COMPOUNDS, DIOXIDES, MILITARY REQUIREMENTS, PERFORMANCE(ENGINEERING)
IDENTIFIERS: \*MAGNESIUM MANGANESE DIOXIDE CELLS, \*MAGNESIUM WANGANESE (II) DXIDE (U)

The magnesium manganese dioxide dry battery system is in production and in field use with encouraging results. Its application will be extended to those military equipments where its performance characteristics are most beneficial. (Author) (U)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMD7 ND- 699 434 10/3

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

69 4P Sulkes, Martin J.

NICKEL-ZINC SECONDARY BATTERIES

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### UNCLASSIFIED REPORT

Availability: Pub. in Annuai Proceedings (23rd), Power Sources Conference, 4p, 20-22 May 69. DESCRIPTORS: (\*STORAGE BATTERIES, \*ALKALINE BATTERIES), BATTERY SEPARATORS, ZINC, NICKEL, TEST METHODS IDENTIFIERS: \*NICKEL ZINC CELLS, ZINC ELECTRODES The Ni-Zn construction parameters that were investigated included zinc electrode configuration, binder and amalgamation, separator system and nickel electrode type. Operational parameters included rates of charge and discharge, temperature, and the effects of reverse discharge. Cells of this construction were subjected to a series of evaluation cycles and were then life cycled. (Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLICGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 699 432

REDESIGN OF BATTERY BB-433/A,

3

Duze, Sylvia A.; 44

## UNCLASSIFIED REPORT

Availability: Pub. in Annual Proceedings (23rd), Power Sources Conference, 4p, 20-22 May

3 DESCRIPTORS: (\*STORAGE BATTERIES, \*ALKALINE BATTERIES), NICKEL, CADMIUM, DESIGN, AIRBORNE, AIRCRAFT EQUIPMENT(U) IDENTIFIERS: BB-433/A BATTERIES, \*NICKEL CADMIUM

3 The report discusses the design of nickel-cadmium aircraft batteries.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

PENNSYLVANIA STATE UNIV UNIVERSITY PARK COLL OF EARTH AND MINERAL SCIENCES AD- 698 487

3 FACTORS IN THE DESIGN OF POROUS ELECTRODES FOR PRIMARY ELECTROCHEMICAL CELLS,

Austin, L. G. ; Gagnon, E. 43P MAY 69

PROJ: DA-1-T-061102-A-34-A, HDL-96800 CONTRACT: DAAG39-67-C-0065

### UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*PRIMARY BATTERIES, ELECTRODES), (\*POROUS METALS, \*ELECTRODES), ELECTROCHEMISTRY, SILVER COMPOUNDS, OXIDES, ELECTROLYTES, POTASSIUM COMPOUNDS, HYDROXIDES IDENTIFIERS: \*POROUS ELECTRODES, SILVER OXIDES

of porous electrode behavior to thin, porous electrodes used at low ambient temperatures, to show how performance is affected by the relevant factors analytical solution was obtained for the equation of behavior. Results from this solution agreed eutectic of aqueous KOH as electrolyte. The report describes the complexity of the cathodic discharge curve; voltage varied with discharge time in six distinct regions. One of these regions, a plateau of almost constant potential was studied in detail. The current density-voltage-temperature internal area, and electrolyte conductivity affect reasonably well with experimental results. In addition, the theory was used to predict the distribution of reaction throughout the electrode The purpose of the work was to apply the theories experimental results agreed well with predicted. It is shown how the theory can be used to predict involved. The system chosen for study was the Ag-AG20 electrode operating in the low-freezing equation, with an activation energy of exchange Optimum electrode thickness, and how porosity, Current of 14.5 kcal/mole. For this system an relations for this region followed a Tafel the result. (Author)

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ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

EAGLE-PICHER INDUSTRIES INC JOPLIN MO AD- 698 030

3 VENTED NICKEL-CADMIUM BATTERY ASSEMBLY BB-500 (

DESCRIPTIVE NOTE: Final rept. 15 Dec 67-30 May 69, Harsch, William C. ; NOV 69 130P Har CONTRACT: DAAB07-68-C-0160 PROJ: DA-1-C-63501-D-518 TASK: 1-C-63501-D-51802

### UNCLASSIFIED REPORT

0160-F

MONITOR: ECOM

33 DESCRIPTORS: (\*STORAGE BATTERIES, \*ALKALINE BATTERIES), (\*POWER SUPPLIES, PORTABLE EQUIPMENT), NICKEL, CADMIUM, DESIGN, MANUFACTURING, MILITARY REQUIREMENTS, PORTIONS OF THIS DOCUMENT ARE NOT FULLY LEGIBLE. ACCEPTABILITY

IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

3 which was to design, develop and test the BB-500()/U battery assembly. The BB-500()/U battery assembly is a rechargeable, vented, sinteredbatteries and are contained in stainless steel trays, housed in a fiberglass exterior case. The battery assembly is equipped with military equipment connectors to prevent reverse polarity and voltage mis-match connections. As a result of the USAECOM connector arrangement, the BB-500()/U battery assembly is rated at 24 volts and 9 ampereplate, nickel-cadmium storage battery. The battery consists of twenty (20) individual, series-connected cells in a double-decked configuration. The individual cells are the BB-437()/U The report contains the results of this contract hours or 12 volts and 18 ampere-hours.

#### UNCI.ASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7 NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION

3 ANALYSIS AND EVALUATION OF SPACECRAFT BATTERY LIFE TEST DATA (PHASE 2).

DESCRIPTIVE NOTE: Summary rept., OCT 69 110P Kent,J. R. REPT. NO. QE/C-69-665

### UNCLASSIFIED REPORT

3 3 RELIABILITY(ELECTRONICS), NICKEL, CADMIUM, LIFE EXPECTANCY, PREDICTIONS, STATISTICAL ANALYSIS, FAILURE(ELECTRONICS), SPACEBORNE IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, \*SPACECRAFT ( \* ALKALINE BATTERIES, DESCRIPTORS: BATTERIES

data collected during present acceptance testing and mathematical/statistical analysis of data generated by life tests on 660 nickel-cadmium spacecraft battery cells. Three major objectives of the whether the acceptance data can be used in making life predictions, and (3) determine if particular analysis were to: (1) determine the reliability of methods of predicting the useful life of the cells, (2) determine the statistical meaning of The report presents the findings from the

correlated with specific environmental factors in ceil, (2) the addition of acceptance data to the prediction model is of little value, and (3) be related to specific environmental factors. Results of the analysis indicate: (1) about 85% accuracy in predicting the useful life of a failure characteristics were found to be highly several instances. (Author)

failure characteristics or combinations thereof could

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AD- 697 938

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

AD- 697 863

GULTON INDUSTRIES INC METUCHEN N J

CYCLE LIFE TESTING OF VENTED, RECHARGEABLE SILVER-CADMIUM CELLS.

DESCRIPTIVE NOTE: Final rept. Sep 68-Jun 69, SEP 69 25P Charlip, S. ; Seiger, H. N. CONTRACT: DA-36-039-AMC-03359(E) PROJ: DA-1-T-662705-A-053

UNCLASSIFIED REPORT

MONITOR: ECOM 03359-F

3 DESCRIPTORS: (\*ALKALINE BATTERIES, TEST METHODS), (\*SIORAGE BATTERIES, ALKALINE BATTERIES), VENTING, CADMIUM, SILVER

3 IDENTIFIERS: \*CADMIUM CELLS, \*SILVER CADMIUM

 $\Xi$ automatic cycling regime consisted of a 6 hour orbit, 3-1/2 hours of charging, and 2-1/2 hours of discharge. The report gives data on cell The objectives of this program was to cycle life test vented silver-cadmium cells, in four sizes with a common base area. The rated cell capacities, at ampere-hours. The report gives the cell capacities for each of the 112th manual discharge cycles, following 110 successive automatic and one manual cycle at 62-1/2% depth of discharge. The the five-hour discharge rates, were: 7.0 ampere-hours, 15.0 ampere-hours, 22.0 ampere-hours, 31.0 capacities for a total of 1008 cycles. (Author)

#### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

)- 697 125 10/3 17/2 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

NEW DESIGNS FOR ZINC-AIR BATTERIES

3

3

DESCRIPTIVE NOTE: Research and development technical rept

Knapp, Howard R. :

NG. ECGM-3182 DA-1-G-663702-D-519 TASK: 1-G-663702-D-51901

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*COMMUNICATION EQUIPMENT, STORAGE
BATTERIES), (\*STORAGE BATTERIES, DESIGN),
ANODES(ELECTROLYTIC CELL), ZINC, CATHODES(ELECTROLYTIC
CELL), LIFE EXPECTANCY, WATER ACTIVATED BATTERIES,
RELIABILITY(ELECTRONICS)
IDENTIFIERS: MECHANICAL RECHARGING, STORAGE BATTERIES,
ZINC AIR BATTERY CELLS

batteries. This comprises 5 units ranging in capacity from 20 ampere-hours to 150 ampere-hours and achieves energy densities from 69 to 86 watthours per the design and construction features of mechanically design considerations for cell and battery components, electrical characteristics for load conditions varying from the 4-hour to the 50-hour rate and performance data over a temperature range development studies on zinc-air batteries for military applications. Information is presented on Since 1965, the U. S. Army Electronics Command has been actively engaged in research and from 0 degrees F to 125 degrees F to substantiate rechargeable zinc-air batteries, with particular attention to the standard family of zinc-air lb. The report provides information on hattery the selection of the present battery designs.

3

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

TYCO LABS INC WALTHAM MASS AD- 697 037

HIGH ENERGY BATTERY SYSTEMS BASED ON PROPYLENE CARBONATE.

3

Jasinski, Raymond 121P

CONTRACT: F19628-68-C-0052 PROJ: AF-8659

MONITON: AFCRL 69-0381 865904 TASK:

### UNCLASSIFIED REPORT

3  $\Xi$ DESCRIPTORS: (\*BATTERY COMPONENTS, ELECTROLYTES), (\*CARBONATES, \*ELECTROLYTES), ORGANIC SOLVENTS, ELECTROCHEMISTRY, ELECTRODES, LITHIUM COMPONDS, PERCHLORATES, ELECTRICAL CONDUCTIVITY, LITHIUM FLUORIDES, SOLUTIONS (MIXTURES), FLUORIDES, SULFIDES, SILVER COMPOUNDS, COPPER COMPOUNDS, NICKEL COMPONDS, (U)NICKEL COMPONDS, LOPPER COMPONDS, NICKEL COMPONDS, NICKEL COMPONDS, BATTERS: \*BATTERY ELECTROLYTES, \*HIGH ENERGY BATTERIES, LITHIUM PERCHLORATE, \*NONAQUEOUS ELECTROLYTES, PROPYLENE CARBONATES

3 application of such systems to high energy batteries. Topics discussed include electrolyte stability, purity requirements, purification procedures, The electrochemistry of electrolyte and electrode systems based on the abrotic organic solvent propylene carbonate is reviewed with emphasis on the solvent-ion interaction phenomena, and electrode reactions of inorganic positives, organic positives, and active metal negatives. Performance of primary battery systems is satisfactory for many purposes. The development of secondary systems and systems for operation at low temperature is discussed.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/2 10/3 AD- 696 428

POWER SOURCES CONFERENCE (23rd ANNUAL), HELD 20-21-22 MAY 1969. PROCEEDINGS.

3

188P

### UNCLASSIFIED REPORT

Availability: Paper copy available from PSC Publications Committee, Red Bank, N. J. 07701.

\$15.00.

SUPPLEMENTARY NOTE: See also Annual rept. no. 22, AD-696 427

DESCRIPTORS: (\*POWER SUPPLIES, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*ENERGY CONVERSION, POWER SUPPLIES), (\*FUZES(CONVERSION), (\*STORAGE BATTERIES, SYMPOSIA), (\*FUZES(ORDNANCE), POWER SUPPLIES), BATTERY COMPONENTS, ELECTRIC BATTERIES, INVERTERS, CONTROL SYSTEMS, ZINC, AIR, THERMOELECTRICITY, GENERATORS IDENTIFIERS: METAL AIR BATTERIES, THERMOELECTRIC POWER

3 3 **GENERATION** 

Topics included are: Fuel cells: Power processing; Primary batteries; Zinc-air batteries; Fuze power sources: Thermal energy conversion.

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AD- 696 428

**20M02** 

AD- 697 037

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ZOMOZ DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. SEARCH CONTROL NO. ZOMO7

)- 696 426 10/3 10/2 10/1 ARMY ELECTRONICS COMMAND FORT MONMOUTH N

POWER SOURCES CONFERENCE (21st ANNUAL), HELD 16-17-18 MAY 1967. PROCEEDINGS.

3

#### 67

3

POWER SOURCES CONFERENCE (22nd ANNUAL), HELD 14-15-16 MAY 1968. PROCEEDINGS.

- 696 427 10/3 10/2 10/1 ARMY ELECTRONICS COMMAND FORT MONMOUTH N

DOC REPORT BIBLIOGRAPHY

UNCLASSIFIED

### UNCLASSIFIED REPORT

Availability: Paper copy available from PSC Publications Committee, Red Bank, N. J. 07701.

SUPPLEMENTARY NOTE: See also Annual rept. no. 21, AD-696 426 and Annual rept. no. 23, AD-696 428.
DESCRIPTORS: (\*POWER SUPPLIES, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*STORAGE BATTERIES, SYMPOSIA), (\*STORAGE BATTERIES, SYMPOSIA), BATTERY COMPONENTS, ELECTRIC BATTERY CHARGERS, CONTROL SYSTEMS, ELECTRODES, IRON, CADMIUM, ZINC, SILVER, AIR, ALKALINE

Publications Committee, Red Bank, N. J. 07701.

Availability: Paper copy available from PSC

UNCLASSIFIED REPORT

142P

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IDENTIFIERS: \*METAL AIR BATTERIES, \*SILVER ZINC BATTERY CELLS, \*ZINC AI BATTERY CELLS

3

Fuel cell systems; Vehicle propulsion batteries; Secondar, batteries; Power technology; Primary batteries; Hydrocarbon fired thermal energy opics included are: Fuel cell electrodes; Conversion.

3

#### Topics included are: Fuel cell control systems; Fuel cell battery hybrid systems; Battery chargers; Overcharge protection; Iron and cadmium electrodes: Zinc silver oxide batteries; High energy cathode materials; Solid electrolyte batteries; Zinc air batteries.

3

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/2 10/3 AD- 696 425

POWER SOURCES CONFERENCE (20th ANNUAL), HELD 24-25-26 MAY 1966. PROCEEDINGS.

3

#### 260P

### UNCLASSIFIED REPORT

Availability: Paper coby available from PSC Publication Committee, Red Bank, N. J. 07701.

SUPPLEMENTARY NOTE: See also Annual rept. no. 19, AD-696 424 and Annual rept. no. 21, AD-696 426.

DESCRIPTORS: (\*POWER SUPPLIES, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*POWER SUPPLIES, SYMPOSIA), (\*POWER SUPPLIES, SYMPOSIA), (\*POWER SUPPLIES, SYMPOSIA), (\*POWER SUPPLIES), (\*SOLAR CELLS, SYMPOSIA), BATTERY COMPONENTS, ELECTRIC BATTERIES, HECTRODES, GENERATING SYSTEMS, ALKALINE BATTERIES, HYDROGEN, VOLTAGE REGULATORS, THERMOELECTRICITY, GENERATORS, THERMIONIC CONVERTERS, SILICON, INVERTERS

SILICON, INVERTERS

BATTERIES, \*HERMOELECTRIC POWER GENERATION (U)

High energy density battery systems: Secondary batteries; Thermal and solar energy conversion; Topics included are: Fuel cell battery systems; Power conditioning.

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### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N 10/3 AD- 696 424

POWER SOURCES CONFERENCE (19th ANNUAL), HELD 18-20 MAY 1965. PROCEEDINGS.

3

#### 199P 9

### UNCLASSIFIED REPORT

Availability: Paper copy available from PSC Publication Committee, Red Bank, N. J. 07701

33 SUPPLEMENTARY NOTE: See also Annual rept. no. 18, AD-696 423 and Annual rept. no. 20, AD-696 425.

DESCRIPTORS: (\*POWER SUPPLIES, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*ENERGY CONVERSION, POWER BATTERIES, SYMPOSIA), (\*ENERGY CONVERSION, POWER SUPPLIES), (\*SOFF CELLS, SYMPOSIA), ELECTRODES, BATTERY COMPONENTS, ELECTRIC BATTERIES, ALKALINE BATTERIES, INVERTERS, BATTERY CHARGERS, DC TO DC CONVERTERS, THERMIONIC CONVERTERS, PHOTOELECTRIC CELLS (SEMICONDUCTOR), THERMOELECTRICITY, GENERATORS, (U \*THERMOELECTRIC POWER GENERATION IDENTIFIERS:

Secondary batteries; New battery systems; Power conditioning; Thermal energy conversion; TPV and Topics included are: Fuel cell batteries; solar energy conversion.

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PAGE

ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

N- 696 423 10/3 10/2 10/1 ARMY ELECTRONICS COMMAND FORT MONMOUTH N AD-

POWER SOURCES CONFERENCE (18th ANNUAL), HELD 19-21 MAY 1964. PROCEEDINGS.

193P 64

### UNCLASSIFIED REPORT

Publication Committee, Red Bank, N. J. 07701. Availability: Paper copy available from PSC

SUPPLEMENTARY NOTE: See also Annual rept. no. 17, AD-696 422 and Annual rept. no. 19, AD-696 424.

DESCRIPTORS: (\*POWER SUPPLIES, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*PUEL CELLS, SYMPOSIA), (\*PUEL CELLS, SYMPOSIA), (\*PUEL CELLS, SYMPOSIA), (\*PUEL CELLS, SYMPOSIA), OWER SUPPLIES), (\*SOLAR CELLS, SYMPOSIA), GAS GENERATING SYSTEMS, HYDROGEN, ELECTRODES, BATTERY COMPONENTS, ELECTRIC BATTERIES, DC TO DC CONVERTERS, INVERTERS, GENERATORS, THERMOELECTRICITY, THERMIONIC CONVERTERS, GUIDED MISSILE BATTERIES, DAMAGE, RADIATION EFFECTS, VOLTAGE REGULATORS, BATTERY CHARGERS, PHOTOELECTRIC CELLS(SEMICONDUCTOR)

IDENTIFIERS: NICKEL CADMIUM BATTERIES, SILVER CADMIUM
CELLS, SILVER ZINC BATTERY CELLS, THERMOELECTRIC POWER
GENERATION

Secondary batteries; Primary batteries; Electrical to Electrical energy conversion; 'opics included are: Fuel cell batteries; Thermal energy conversion; Solar energy conversion.

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#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

7 )- 696 422 10/1 ARMY ELECTRONICS COMMAND FORT MONMOUTH N 10/3

POWER SOURCES CONFERENCE (17th ANNUAL), HELD 21-23 MAY 1963. PROCEEDINGS.

3

195P 63

### UNCLASSIFIED REPORT

Availability: Paper copy available from PSC Publication Committee, Red Bank, N. J. 07701.

SUPPLEMENTARY NOTE: See also Annual rept. no. 16, AD-696 421 and Annual rept. no. 18, AD-696 423.

DESCRIPTORS: (\*POWER SUPPLIES, \*SYMPOSIA), (\*SOLAR CELLS, SYMPOSIA), (\*ENERGY CONVERSION, POWER SUPPLIES), (\*FUEL CELLS, SYMPOSIA), (\*STORAGE BATTERIES, SYMPOSIA), (\*STORAGE BATTERIES, SYMPOSIA), (\*PRIMARY BATTERIES, SYMPOSIA), SILICON, DAMAGE, RADIATION EFFECTS, GENERATORS, THERMOCLECTRICITY, THERMIONIC CONVERTERS, ELECTRODES, BATTERY COMPONENTS, ELECTRIC BATTERIES, THERMOCOUPLES, DC TO DC CONVERTERS, INVERTERS, FREQUENCY CONVERTERS, DC TO DC CONVERTERS, INVERTERS, REQUENCY CONVERTERS, DENTIFIERS: AMMONIA BATTERIES, NICKEL CADMIUM BATTERIES, SILVER CADMIUM CELLS, \*THERMOELECTRIC POWER GENERATION (U) 3

3 Topics included are: Solar energy conversion; Thermal energy conversion; Fuel cell batteries; The future of fuel celTs; Secondary batteries; Primary batteries; Electrical conversion.

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ZOM07 SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/1 10/2 10/3

POWER SOURCES CONFERENCE (16th ANNUAL), HELD 22-24 MAY 1962. PROCEEDINGS

3

184P MAY 62

### UNCLASSIFIED REPORT

Availability: Paper copy available from PSC Publication Committee, Red Bank, N. J. 07701.

SUPPLEMENTARY NOTE: See also Annual rept. no. 15, AD-421 601, and Annual rept. no. 17, AD-696 422.

DESCRIPTORS: (\*POWER SUPPLIES, \*SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*FUEL CELLS, SYMPOSIA), (\*ENERGY CONVERSION, POWER SUPPLIES), SYMPOSIA), (\*ENERGY CONVERSION, POWER SUPPLIES), BATTERIES, ELECTRODES, GENERATORS, THERMOELECTRIC BATTERIES, ELECTRODES, GENERATORS, THERMOELECTRICITY, THERMIONIC CONVERTERS, RADIOACTIVE ISOTOPES, ELECTRIC POWER PRODUCTION, NUCLEAR REACTORS, AUXILIARY POWER, PLANTS, SPACEBORNE, ALKALINE BATTERIES, INVERTERS, DC TO CONVERTERS

IDENTIFIERS: \*NICKEL CADMIUM BATTERIES, \*REGENERATIVE FUEL CELLS, \*SILVER CADMIUM CELLS, \*SILVER ZINC BATTERY CELLS, \*THERMOELECTRIC POWER GENERATION (U)

mechanisms: Fuel cell batteries and systems; Thermal energy conversion; Solar energy conversion; Secondary batteries; Primary batteries; Electrical to electrical energy Topic included are: Fue! cell materials and conversion.

3

### UNCLASSIFIED

ZOWOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 695 626

MAINTENANCE-FREE LEAD ACID BATTERIES

3

Wagner, Otto C. Technical rept., 22P DESCRIPTIVE NOTE: 69 AUG

DA-1-T-662705-A-053 REPT. NO. ECOM-3168 PROJ:

1-T-662705-A-05302

FASK:

UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES,
RELIABILITY(ELECTRONICS)), MAINTENANCE, DESIGN,
ELECTRODES, ELECTROLYTES, BATTERY SEPARATORS, BATTERY
COMPARTMENTS, ELECTRIC DISCHARGES, LIFE EXPECTANCY,
COSTS, THERMAL STABILITY, STORAGE, ARMY EQUIPMENT
IDENTIFIERS: EVALUATION, \*LEAD ACID BATTERIES

33

An evaluation program on maintenance-free lead-acid batteries was conducted at the US Army

3 Electronics Command for the purpose of determining the feasibility of replacing some of the more expensive nickel-cadmium batteries in the field. With the elimination of troublesome.water makeup along with the employment of new state-of-the-art electrode designs, which feature long life and efficient high rate discharge capabilities, the familiar lead-acid battery has become attractive as high capacity, long life battery with low user cost. Environmental testing has been completed. This battery, with lead-calcium grids, will retain 70% of discharge was demonstrated, no water makeup being of its initial capacity after storage at 125F for 30 days. A cycle life of 200 cycles at 80% depth required during cycling. (Author)

AD- 696 421

PAGE

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 695 610

QUALITY ASSURANCE PROGRAM FOR ZINC ANDDE-ELECTROLYTE COMPOSITES.

 $\Xi$ 

DESCRIPTIVE NOTE: Technical rept., AUG 69 19P Sague, David M.; Linden,

DA-1-G-663702-D-519 ECOM-3162 PROJ:

David :

TASK: 1-G-663702-D-51901

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*SIORAGE BATTERIES, QUALITY CONTROL), ANODES(ELECTROLYTIC CELL), ELECTROLYTES, ZINC, AIR IDENTIFIERS: \*METAL AIR BATTERIES, \*ZINC AIR BATTERY

3 covering quality control, evaluation, and acceptance procedures to assure the required quality level and success in upgrading the quality and performance of performance of the anode electrolyte composite for manufacturing procedures or design and indicating direction for further improvement are presented. composites manufactured by two suppliers. Other benefits of the program in detecting changes in The report presents the details of this quality assurance program and presents data showing its the mechanically rechangeable zinc-air battery. quality assurance program was established (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION 22/2 AD- 694 010

EVALUATION PROGRAM FOR SECONDARY SPACE CRAFT CELLS
- ACCEPTANCE TEST OF GENERAL ELECTRIC COMPANY 12
AMPERE-HOUR AUXILIARY ELECTRODE NICKEL-CADMIUM

3

Christy, Donald E. QE/C-69-553 REPT. NO.

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored by National Aeronautics and Space Administration, Greenbelt, Md. Goddard

Space Flight Center.

DESCRIPTORS: (\*STORAGE BATTERIES.

RELIABILITY(ELECTRONICS)), SPACECRAFT, LEAKAGE(FLUID),

ELECTRICAL PROPERTIES, SEALS, TEST FACILITIES,

EQUATORIAL ORBITS, SIMULATION

33 EVALUATION, NICKEL CADMIUM BATTERIES DENTIFIERS:

3 The document presents the results of acceptance tests of 12 ampere-hour sealed nickel-cadmium Secondary spacecraft cells.

PAGE

ZOM07 SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N 10/3

MECHANICALLY RECHARGEABLE ZINC-AIR BATTERY

 $\widehat{\Xi}$ 

Linden, David DESCRIPTIVE NOTE: Technical rept., ND. ECOM-3153 DA-1-G-663702-D-519 PROJ:

TASK: 1-G-663702-D-51901

### UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE BATTERIES, EXPERIMENTAL DESIGN),
ANODES(ELECTROLYTIC CELL), ZINC, CATHODES(ELECTROLYTIC
CELL), AIR. ELECTROLYTES, POTASSIUM COMPOUNDS,
HYDROXIDES, VOLTAGE, WEIGHT, LIFE EXPECTANCY,
RELIABILITY(ELECTRONICS), THERMAL PROPERTIES, COSTS,
ENERGY, COMMUNICATION EQUIPMENT
IDENTIFIERS: COMPARISON, \*MECHANICALLY RECHARGEABLE
BATTERIES, \*ZINC AIR BATTERY CELLS
(U)

3 encouraged its use with portable military equipment in communications, surveillance and other forward area uses. The characteristics and electrical performance of this new battery are discussed and its The mechanically rechargeable zinc-air battery is a order of 100 watthours per pound, twice that of the closest competing battery system. The many advantageous characteristics of this battery have advantages over other battery systems are illustrated. The applications of this battery in communication, surveillance and other forward area military applications also are described. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY 10/3 AD- 693 844

GULTON INDUSTRIES INC METUCHEN N J RESEARCH AND DEVELOPMENT DIV

CYCLE LIFE TESTING OF SEALED, RECHARGEABLE SILVER-CADMIUM CELLS.

3

ż DESCRIPTIVE NOTE: Final rept. Sep 68-Jun 69, SEP 69 26P Charlip, S. ; Seiger, H. CONTRACT: DA-36-039-AMC-03358(E) PROJ: DA-1-T-662705-A-05302 TASK: 1-T-662705-A-05302

MONITOR: ECOM

03358-F

### UNCLASSIFIED REPORT

CADMIUM CELLS, \*SILVER CADMIUM CELLS DESCRIPTORS: (\*STORAGE BATTERIES, RELIABILITY(ELECTRONICS)), TEST METHODS, SILVER, IDENTIFIERS: CADMIUM

33

cycles following 110 successive automatic and one manual cycle at 62-1/2 % depth of discharge based on rated capacity. The automatic cycling regime consisted of a 6 hour orbit, 3-1/2 hours of charging and 2-1/2 hours of discharge. The report gives data on cell capacities for a total of 1008 cycles: silver-cadmium cells. The report gives the cell capacities for each of the 112th manual discharge Reported are the cycle life tests of sealed, (Author)

3

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

)- 692 538 10/2 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N AD- 692 538

3 FAST TRANSIENT RESPONSE FUEL CELL-BATTERY HYBRID POWER SOURCE,

Frysinger, Galen R.; 5 1AN 69

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Proceedings of International Automotive Engineering Congress, Detroit, Mich., 13-17 Jan 69. Society of Automotive Engineers Paper No. 690205.

DESCRIPTORS: (\*BATTERY COMPONENTS, DESIGN), (\*POWER SUPPLIES, DESIGN), (\*FUEL CELLS, DESIGN), CARBONATES, ELECTROLYTIC CELLS, RESPONSE, CERAMIC MATERIALS, THERMAL PROPERTIES, TRANSIENTS, ALKALINE BATTERIES, TIME, 3 (U) TIME

 $\widehat{\Xi}$ IDENTIFIERS: \*FUEL CELL BATTERY HYBRID SYSTEMS, ELECTROLYTES, FUSED SALTS, MOLTEN CARBONATE FUEL

characteristics as well as the ability to accept high The integration of a molten carbonate fuel cell with a molten electrolyte battery both electrically and thermally produces a highly efficient power source with a fast transient response. Since most practical high pulse applications utilize electronic hybrid package can be designed with optimum response chopping circuits, microsecond and millisecond response characteristics of a power source are of importance. Ceramic monoblock construction of a reverse power flow. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

٥ ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER WASHINGTON

3 PERFORMANCE OF NICKEL-IRON CELLS OPERATING UNDER PULSE CONDITIONS.

TEPT. NO. FSTC-HT-23-625-68 PROJ: FSTC-0423100

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Trans. of Akademiya Nauk Latviiskoi SSR, Riga. Izvestiya. Seriya Fizicheskikh i Tekhnicheskikh Nauk, n5 p119-126

DESCRIPTORS: (\*STORAGE BATTERIES,

3 PERFORMANCE(ENGINEERING)), NICKEL, IRON, DIRECT CURRENT PULSES, POWER, USSR IDENTIFIERS: LOADING(ELECTRICAL), TRANSLATIONS

3 of nickel-iron cells under pulse-loads are examined. Transient processes and operating characteristics

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 691 710 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N CHARGING THE SILVER-ZINC SECONDARY BATTERY SYSTEM. PART I. FORMATION CHARACTERISTICS.

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DESCRIPTIVE NOTE: Technical rept.,
JUN 69 18P Sulkes, Martin J.;
REPT. NO. ECOM-3139
PROJ: DA-1-T-662705-A-05302
TASK: 1-T-662705-A-05302

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, BATTERY CHARGERS), (\*ALKALINE BATTERIES, \*BATTERY CHARGERS), ZINC, SILVER, TEST METHODS, ELECTRODES (U) IDENTIFIERS: CHARGING, \*SILVER ZINC BATTERY CELLS (U)

Dry uncharged silver-zinc batteries exhibit a reverse voltage as high .s 0.8 V/cell after filling with electrolyte. This negative voltage presents a problem with regard to initiating the first charge with charger-current characteristics of unformed silver-zinc batteries and the individual electrodes were determined. The unformed silver-zinc battery has the potential of 0.7 - 0.8 volts. The unformed currents before the voltage reaches zero volts. Therefore, short circuiting before charge and/or connection to an auxiliary power source will drive the voltage positive in a short time, permitting initiation of charge on a reverse voltage protected charge. If reverse voltage protection is not employed in the charger, the reverse voltage of an unformed battery will not support sufficient currents to damage the charger. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOTAD- 691 355 10/3

4D- 691 355 10/3 GULTON INDUSTRIES INC METUCHEN N J RESEARCH AND DEVELOPMENT DIV ACCEPTANCE TESTING OF VENTED, RECHARGEABLE SILVER-CADMIUM CELLS.

3

DESCRIPTIVE NOTE: Final rept. Sep 68-Jan 69,
AUG 09 38P Charlip, S. ; Seiger, H. N. ;
CONTRACT: DA-36-039-AMC-03359(E)
PROJ: DA-1-C-622001-A-053
TASK: 1-C-622001-A-05302

# UNCLASSIFIED REPORT

03359-F

MONITOR: ECOM

SUPPLEMENTARY NOTE: See also Final rept. dated Dec 67, AD-664 777.

DESCRIPTORS: (\*ALKALINE BATTERIES, ACCEPTABILITY), (\*STORAGE BATTERIES, TEST METHODS), SILVER, CADMIUM (U) IDENTIFIERS: SILVER CADMIUM CELLS (U)

The report gives the capacities obtained from acceptance testing of four silven-cadmium cells under the following conditions: room temperature capacity and seven day storage; cold temperature (-40F); and high temperature (+160F) seven day storage. Two cells failed to meet the minimum capacity requirements after the high temperature storage. All other test results fell within the limits of the specification and contract.

UNCLASSIFIED

PAGE

SEARCH CONTROL NO. ZOMO7 GULTON INDUSTRIES INC METUCHEN N J RESEARCH AND DOC REPORT BIBLIOGRAPHY 10/3 DEVELOPMENT DIV AD- 691 354

UNCLASSIFIED

ACCEPTANCE TESTING OF SEALED, RECHARGEABLE SILVER-CADMIUM CELLS.

3

DESCRIPTIVE NOTE: rinal rept.,
AUG 69 40P Charlip,S.;Seiger,H. N.
CONTRACT: DA-36-039-AMC-03358(E)
PROJ: DA-1-G-622001-A-053
TASK: 1-G-622001-A-05302
MONITOR: ECOM 03358-F

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, ACCEPTABILITY), (\*STORAGE BATTERIES, TEST METHODS), SILVER, CADMIUM IDENTIFIERS: SILVER CADMIUM CELLS

3 temperature (-20F), and high temperature (+160F) seven day storage. The high temperature storage test caused two cells to lose more capacity than expected. All other test results fall within the limits of specification. (Author) The objectives of this program are to test sealed silver-cadmium cells, in four sizes, with a common base area. The report gives the capacities cadmium cells under the following conditions: room obtained from acceptance testing of four silvertemperature capacity and seven day storage, low

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

DEFENCE CHEMICAL BIOLOGICAL AND RADIATION ESTABLISHMENT OTTAWA (ONTARIO) AD- 691 176

3 THE ELECTROLYTIC SINTERING OF NICKEL POWDER

Henderson, I. H. S. ; Ladan,

REPT. NO. DCBRE-564 36 89 MAY

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, SUBSTRATES), (\*NICKEL, ELECTRODEPOSITION), POROUS METALS, POWDER METALLURGY, NICKEL COMPOUNDS, ELECTRODES, CANADA, HYDROXIDES, ELECTROCHEMISTRY IDENTIFIERS: NICKEL(II) HYDROXIDE, NICKEL POWDER, NICKEL CADMIUM CELLS Copies furnished. SUPPLEMENTARY NOTE: Revision of report dated 6 Dec Availability: Pub. in The Canadian Jnl. of Chemical Engineering, v46 p361-363 Oct 68. No

3 3

3 solutions containing nickel powder in suspension, providing the concentration of free acid is maintained sufficiently high to inhibit co-deposition of Ni(DH)2. In nitrate solution, cathodic reduction of nitrate and deposition of Ni(DH)2 similar to sintered nickel may be made from sulphate, chloride, fluoborate or sulphamate nickel plating Adherent and coherent deposits of nickel sponge predominates. (Author)

PAGE

AD- 691 176

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

LEESONA CORP GREAT NECK N Y LEESONA MOOS LABS DIV 17/2

DEVELOPMENT OF ZINC/AIR 24 VOLT, 20 AMPERE-HOUR STANDARD LINE BATTERY SYSTEM.

3

DESCRIPTIVE NOTE: Final rept. 8 Mar-29 Nov 68 Noorily, Peter ; DAAB07-68-C-0265 JUN 69 51P CONTRACT: MONITOR:

0265-F

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*COMMUNICATION SYSTEMS, POWER SUPPLIES), (\*BATTERY COMPONENTS, DESIGN), ANDDES(ELECTROLYTIC CELL), ZINC, CATHODES(ELECTROLYTIC CELL), BATTERY SEPARATORS, BATTERY COMPARTMENTS, WATER ACTIVATED BATTERIES, LIFE EXPECTANCY, (U)LIFE EXPECTANCY CELLS

 $\widehat{\Xi}$ 

reservoir to permit long operating life. In addition, the battery design required light weight and high strength, with a capability of being easily to be utilized in military communication applications. The primary objective of this program was the development of a reliable zinc/air battery system which will include an adequate water ō high energy density and be operational over a wide This report describes the design and development the 20 ampere-hour Standard Line Battery system recharged. The battery system was also to have temperature range. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

15/3 - 690 631 10/3 18/4 TRACERLAB/WEST RICHMOND CALIF RADIAC POWER REQUIREMENTS STUDY.

3

Final rept. May 67-Jul 68, Sturman, Ivan P. ;Kleinstein, 43P DESCRIPTIVE NOTE: Benjamin J.; MAY 68

TRC-69-16 CONTRACT: N00228-67-c-2307 USNRDL MONITOR:

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Office of Civil Defense, Washington, D. C. DESCRIPTORS: (\*RADIATION MONITORS, POWER SUPPLIES), (\*DRY BATTERIES, RADIATION MONITORS), CIVIL DEFENSE, OPERATIONAL READINESS, OPERATION, TEST METHODS, VOLTAGE, THERMAL STABILITY, AGING(MATERIALS), COSTS

3 As part of the Office of Civil Defense task to improve the capabilities of radiological survey instruments, a study was performed to investigate the Dower requirements of the CD V-715 instruments and the characteristics of the specified power source cells. Valtage and current measurements taken under load were correlated with cell age. Tests included operation of the cells at temperature extremes specified as operating limits for the CD types until the instrument could no longer be zeroed. conventional and other commercially available cell V-715, as well as continuous operation of (Author)

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#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

SONOTONE CORP ELMSFORD N Y AD- 688 520

3 OPTIMUM STRUCTURES FOR MINIATURE NI-CA SEALED CELLS AND BATTERIES.

DESCRIPTIVE NOTE: Rept. no. 4 (Final) Oct 67-Nov

Belove, L. ; Thornell, S. ; 212P Pivarnik, J. ;

CONTRACT: DA-28-043-AMC-02361(E)
PROJ: DA-1-C-622001-A-053

1-C-622001-A-05302 02361-F MONITOR: ECOM

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also quarterly report no. 3, AD-PORTIONS OF THIS DOCUMENT ARE ILLEGIBLE. SEE INTRODUCTION OF THIS ANNOUNCEMENT JOURNAL FOR CFSTI ORDERING INSTRUCTIONS.

33 DESCRIPTORS: (\*ALKALINE EXTTERIES, OPTIMIZATION),
MINIATURE ELECTRICAL EQUIPMENT, BATTERY COMPONENTS,
ELECTRIC BATTERIES, ELECTRODES, NICKEL, CADMIUM,
ELECTRICAL PROPERTIES, CONTAINERS, ADDITIVES,
ELECTROLYTES, COBALT COMPOUNDS, MECHANICAL DRAWING,
SPECIFICATIONS, LIFE EXPECTANCY
IDENTIFIERS: \*NICKEL CADMIUM BATTERIES

BATTERIES

primarily divided into three major categories as follows: The effects of various electrochemical treatments on the energy density of the nickel oxide positive electrode were evaluated; In order to maximize the ratio of negative electrode capacity to effects of electrolyte quantity and concentration on cell performance were studied; Furthermore, the ratio was ultimately accomplished by increasing both electrode weight, the performance levels of pasted the porosity and volume of the negative electrode. capacities was found to have a marked effect on overall cell performance. The desired optimum ratio of negative to positive plate ampere-hour The tasks relating to the optimization of the electro-chemical aspects of cell design were cadmium (CdO) electrodes were studied; The

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

SONOTONE CORP ELMSFORD N Y

DESIGN IMPROVEMENT OF BB 501()/U BATTERY

3

Mar 67-Nov 68 DESCRIPTIVE NOTE: Final rept. 29 MAR 69 143P Pivarnik,

Pivarnik, John ; MAR 69 143P Piv CONTRACT: DAAB07-67-C-0380 PROJ: DA-1-C-622001-A-053 TASK: 1-C-622001-A-05302

0380-F MONITOR: ECOM

# UNCLASSIFIED REPORT

PERFORMANCE(ENGINEERING)), (\*STORAGE BATTERIES,
PERFORMANCE(ENGINEERING)), DESIGN,
RELIABILITY(ELECTRONICS), SPECIFICATIONS, MECHANICAL
DRAWINGS, NICKEL, CADMIUM, CONTAINERS, REINFORCED
PLASTICS, ELECTRIC CONNECTORS, ENVIRONMENTAL TESTS,
GLASS TEXTILES, DROP TESTS
IDENTIFIERS: BATTERY CASES, NICKEL CADMIUM DESCRIPTORS: (\*ALKALINE BATTERIES

3 3

The objective of this design improvement contract was to perfect a 20-cell, 24 volt, 14 A. H. nickel-cadmium storage battery more rugged, economical, and maintainable, as well as lighter, than the original BB504()/U. This was accomplished by combining existing design features with ones incorporated in the BB610()/U. The production requirement for sixty-five batteries on an unqualified basis was completed. In addition, four improved units were qualified in accordance with two for the results of these tests, Sonotone test-data sheets are given. Included in this report are the official indented BB501()/U parts list and a full set of manufacturing drawings. In addition, there are illustrations showing design improvements drop test, and the three-foot water immersion test. required environmental tests: the four-foot random to the battery as described in the text. (Author)

3

SEC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 687 260 10/2 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J FAST TRANSIENT RESPONSE FUEL CELL - BATTERY HYBRID POWER SOURCE. (U)

DESCRIPTIVE NOTE: Research and development technical rept...
JAN 69 9P Frysinger, Galen R.;
REPT. NO. ECOM-3104

DA-1-T-061101-A-91-A

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*FUEL CELLS, \*STORAGE BATTERIES),
(\*HYDROCARBONS, FUEL CELLS), (\*LITHIUM, STORAGE
BATTERIES), DESIGN, CARBONATES
IDENTIFIERS: FUEL CELL BATTERY HYBRID SYSTEMS,
HYDROCARBON AIR FUEL CELLS, ELECTROLYTES, FUSED SALTS,
MOLTEN CARBONATE FUEL CELLS
(U)

The integration of a molten carbonate fuel cell with a molten electrolyte battery both electrically and thermally produces a highly efficient power source with a fast transient response. Since most practical high pulse applications utilize electronic chopping circuits, microsecond and millisecond response characteristics of a power source are of importance. Ceramic monoblock construction of a hybrid package can be designed with optimum response characteristics as well as the ability to accept high reverse power flow. (Author)

#### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MO7

AD- 686 665 7/2 7/4 NAVAL ORDNANCE LAB WHITE DAK MD THERMOANALYTICAL INVESTIGATIONS OF THE CUPRATE (III) ANION.

DESCRIPTIVE NOTE: Technical rept.
DEC 68 26P Root,Charles B.
REPT. NO. NOLTR-68-185
PROJ: IR-75

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*COPPER COMPOUNDS, SYNTHESTS(CHEMISTRY)),
(\*ELECTRODES, COPPER COMPOUNDS), OXIDATIUN, CALCIUM
COMPOUNDS, BARIUM COMPOUNDS, STRONTIUM COMPOUNDS,
HYDOCHLORITES, HYDROXIDES, DIFFERENTIAL THERMAL
ANALYSIS, PRIMARY BATTERIES, CATHODES(ELECTROLYTIC
CELL)
IDENTIFIERS: BARIUM OXIDES, COPPER(I) OXIDE,
COPPER(II) OXIDE, MOLTEN ELECTROLYTE BATTERIES
(U)

Thermogravimetric and differential thermal analysis of new reactions yielding copper(III) compounds are discussed. Potassium metal plus copper(II) oxide yields potassium cuprate(III) at ca 280C. Sodium and barium peroxide plus copper(II) oxide yield sodium and barium cuprate (III) respectively at ca 700C. The reaction parameters involved in these reactions are identified and discussed. Copper(II) oxide was observed to disproportionate in the presence of barium oxide at temperatures greater than 650C yielding copper(I) oxide and barium cuprate(III). (Author)

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PAGE

ZOW0Z SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD-

SEPARATOR MATERIALS FOR THE LITHIUM-CHLORINE BATTERY.

 $\Xi$ 

Beals, David L. ; Mapes Technical rept., 18P DESCRIPTIVE NOTE: MAR 69

. ECOM-3105 William H.

DA-1-T-662705-A-053 1-T-662705-A-05302 TASK:

# UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*BATTERY SEPARATORS, CERAMIC MATERIALS), (\*LITHIUM, \*STORAGE BATTERIES), (\*CHLORINE, STORAGE BATTERIES), (\*CHLORINE, STORAGE BATTERIES), ELECTROLYTES, NITRIDES, BORON COMPOUNDS, ALUMINUM COMPOUNDS, SILICON COMPOUNDS, CHLORIDES, LITHIUM COMPOUNDS. POTASSIUM COMPOUNDS IDENTIFIERS: ALUMINUM COMPOUNDS, NITRIDES, BORON NITRIDES, LITHIUM CHLOR'DE, LITHIUM CHLORINE CELLS, MOLTEN ELECTROLYTE BATTERIES, ELECTROLYTES, FUSED SALTS, POTASSIUM CHLORIDE, SILICON NITRIDES

3 lithium-chlorine cells for periods of up to 284 hours common insulating materials, such as those based on A1203, SiO2, or organic materials, would fail due to high operating temperature (450C), corrosive environment experienced by the separator. number of commercial ceramic materials as possible discharge cycled. The materials showing the least corrosion at the conclusion of this investigation were binder-free BN, hot pressed AlN, and Hot or solubility in the molten salt electrolyte. Several promising materials were investigated in The objective of this study was to investigate a anode-cathode separator materials for a lithiumchlorine battery. It had been demonstrated that during which the cell was continuously chargepressed Si3N4.

#### UNCLASSIFIED

SEARCH CONTROL NO. DOC REPORT SIBLIDGRAPHY

GOULD-NATIONAL BATTERIES INC MINNEAPOLIS MINN RESEARCH 10/3

DESIGN AND FABRICATION OF 300 VOLT, 3.6 KILDWATT PILE-TYPE BIPOLAR LEAD-ACID BATTERY FOR PULSE

3

DESCRIPTIVE NOTE: Final rept. 29 Dec 67-29 Sep 68. DEC 68 30P Nelson, R. D. ; Nelson, R. D. ; DEC 68

N00123-68-C-0862 GNBI-68D-041 REPT. NO. CONTRACT:

# UNCLASSIFIED REPORT

33 JESCRIPTORS: (\*STORAGE BATTERIES, \*LEAD(METAL)), DESIGN, ELECTRODES, LEAD ALLOYS, BATTERY SEPARATORS, SULFURIC ACID, EPOXY RESINS, POLYETHYLENE PLASTICS, TEST DESCRIPTORS: METHODS

IDENTIFIERS: LEAD ACID BATTERIES

 $\widehat{\Xi}$ thinner, low resistance separators, and investigation modular pulse-power, pile-type, lead-acid battery for test and evaluation as a potential building block in the construction of large pulse-power arrays. Work included a factorial test to determine the effects of under development to the design and fabrication of a electrodes made from a special alloy, voltage and current efficiency measurements, determination of It was proposed to adapt materials and processes operating parameters on cycle life, studies of Operating characteristics of larger batteries, Studies of more compact designs incorporating of a low-maintenance design utilizing gelled electrolyte. (Author)

UNCLASSIFIED

PAGE

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 685 856 10/3 17/2.1 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J LIGHTWEIGHT, LOW TEMPERATURE RESERVE TYPE
MAGNESIUM PERCHLORATE BATTERY BA-836()/U FOR
MANPACK COMMUNICATION-ELECTRONIC EQUIPMENT. (U)

DESCRIPTIVE NOTE: Research and development technical rept.,
MAR 69 31P Almerini, Achille L.;
REPT. NO. ECOM-3093

DA-1-T-662705-A-053

PROJ:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, TRANSMITTER RECEIVERS), (\*LOW TEMPERATURE BATTERIES, TRANSMITTER RECEIVERS), PORTABLE EQUIPMENT, MAGNESIUM COMPOUNDS, PERCHLORATES, STORAGE, LIFE EXPECTANCY, COMMUNICATION EQUIPMENT, CALCIUM COMPOUNDS, ELECTROLYTES, RELIABILITY(ELECTRONICS)

DENTIFIERS: MAGNESIUM PERCHLORATE, RESERVE
(U)

The report describes internal investigations of Battery BA-836( )/U which are highly relevant to the present advanced development work. The studies proved that long term unactivated storage life is feasible with simple, inexpensive packaging, that good battery performance is attainable under low as well as high rate discharge conditions, that low temperature performance is highly dependent on electrolyte formulation, and that optimum electrolyte formulations can be readily achieved. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 685 849 10/3 15/5 ARMY LOGISTICS MANAGEMENT CENTER FORT LEE VA PROCUREMENT AND STOCKAGE POLICIES FOR DRY BATTERIES: SUPPLY CONTROL FOR DRY BATTERIES. (U)

DESCRIPTIVE NOTE: Final rept., OCT 68 53P Kaplan, Alan J.; Deemer, Robert L.;

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*DRY BATTERIES, INVENTORY CONTROL), ARMY PROCUREMENT, INVENTORY CONTROL, FOREIGN AID, MILITARY OPERATIONS, SAFETY, MATHEMATICAL PREDICTION, ERRORS, BATTERY COMPONENS, ELECTRIC BATTERIES, LOGISTICS IDENTIFIERS: DEMAND(ECONOMICS), LOGISTICS MANAGEMENT, MAP(MILITARY ASSISTANCE PROGRAMS), MILITARY ASSISTANCE

A study was made of procedures for setting safety levels and forecasting requirements for dry batteries. Many conclusions were reached concerning use of variable safety levels, safety levels for MAP demand, causes of forecast error, and forecasting techniques. Mathematical work was done which permits estimates of system performance to be made based on the forecast errors actually experienced. (Author)

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

CHARACTERISTICS OF m-DINITROBENZENE (m-DNB) DRY ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

DESCRIPTIVE NOTE: Research and development technical

CELLS.

36P rept..

Doe, James Bruce; ECOM-3089

DA-1-T-662705-A-053 1-T-662705-A-05302 TASK:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*DRY BATTERIES, \*NITROBENZENES), (\*MAGNESIUM, \*STORAGE BATTERIES), PERCHLORATES, MANUFACTURING, ELECTRIC DISCHARGES IDENTIFIERS: MAGNESIUM PERCHLORATE, MAGNESIUM DINITROBENZENE CELLS, ORGANIC BATTERIES

3 3

> buB system is evaluated for various temperatures, hourly rates, and shelf-life periods. Extensive data is given for three cell sizes: 'R(N)', 'A' and 'D'. Techniques for fabrication of the above cells, which are adaptable for high-speed assembly, are mentioned. Finally, a comparison of the Mg/Mg(ClO4)2/m-DNB system with the inhibition, and a mechanical seal will have to be initiated in the Mg/m-DNB system before it will Improvements in cathode efficiency, corrosion be able to compete with the present Mg/MnO2 to energy densities and performance curves. Mg/Mg(C104)2/MnO2 is given with respect The performance of the Mg/Mg(C104)2/msystem. (Author)

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#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

PENNSYLVANIA UNIV PHILADELPHIA POWER INFORMATION

METAL-AIR BATTERIES SYMPOSIUM COMPENDIUM OF PAPERS PRESENTED FOR PUBLICATION,

 $\Xi$ 

Wagner, Otto C. ; Sulkes, Martin :Knapp, Howard R. : Toni, Jorge E. : REPT. NO. PIC-BAT-209/11 68

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at symposium, sponsored by Interagency Advanced Power Group, NASA Goddard Space Flight Center, Greenbelt, Md., 11 Sep 68. DESCRIPTORS: (\*STORAGE BATTERIES, SYMPOSIA), MAGNESIUM, ZINC, LITHIUM, AIR, CADMIUM AIR CELLS, MAGNESIUM AIR CELLS, \*METAL AIR BATTERIES, ZINC AIR BATTERY CELLS, (U

3 11 September 1968. These papers are concerned with the following topics: Secondary cadmium-air batteries; Secondary iron-air batteries; Zinc-air batteries; Lithium This publication includes the papers summarizing the material presented by speakers at the Metal-Air Batteries Symposium which was sponsored by the Electrochemical Working Group of the Interagency Advanced Power Group (IAPG) on

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

GULTON INDUSTRIES INC METUCHEN N & RESEARCH AND DEVELOPMENT DIV AD- 683 466

 $\widehat{\Xi}$ DESIGN, FABRICATION OF PROTOTYPES, AND TESTING OF SEALED, RECHARGEABLE SILVER-CADMIUM CELLS.

DESCRIPTIVE NOTE: Final rept. Feb 67-Oct 68, FEB 69 35P Charlip,S. :Michaels,R. : CONTRACT: DA-36-039-AMC-03358(E) PROJ: DA-1-G-622001-A-053 TASK: 1-G-622001-A-05302 Katz,R. ;

# UNCLASSIFIED REPORT

03358-F

MONITOR: ECOM

DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), (\*ALKALINE BATTERIES, DESIGN), ELECTRODES, MANUFACTURING, BATTERY COMPONENTS, ELECTRIC BATTERIES, SILVER, CADMIUM IDENTIFIERS: SILVER CADMIUM CELLS

for room and high temperature storage, cold temperature, and early data on cycle life. The results of the tests and conclusions to be drawn from capacities obtained from engineering evaluation tests The manufacture of the pasted silver electrodes and Both electrodes have pure silver substrates of one-piece construction. The separator system used in the sealed cells is delineated. Cell construction and assembly is given in detail, with accompanying drawings. The activation and formation procedures of the pressed cadmium electrodes is described. for cells are described. The report gives the them are discussed. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 683 461

Mandel, Hyman J. ; Sulkes, Martin J. ; Wagner, Otto C. ; Knapp, Howard R. Technical rept., 28P METAL-AIR CELLS DESCRIPTIVE NOTE: 89

3

REPT. NO. ECOM-3061 PROJ: DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*PRIMARY BATTERIES, DESIGN), (\*STORAGE
BATTERIES, DESIGN), AIR, MAGNESIUM, CADMIUM, ZINC, IRON,
ELECTROLYTES, ELECTRODES, BATTERY COMPONENTS, ELECTRIC
BATTERIES, REVIEWS
IDENTIFIERS: CADMIUM AIR CELLS, MAGNESIUM AIR CELLS,
\*METAL AIR CELLS, ZINC AIR BATTERY CELLS

3

3 (secondary) metal-air cells avoids the decrease in energy density that otherwise would occur if non-noble metal air cathodes, in combination with design are reviewed. Estimates of energy densities for the four systems range from 40 to 80 Wh/lb. Modifications of anode make-up and electrolyte composition have improved capacity and cycle life. auxiliary charging electrodes, were used. Electrode-electrolyte balance, active anode material utilization, water balance, dendrite formation, carbon dioxide contamination, etc. are among the areas which have been studied and which Information is presented on primary magnesium-air and secondary cadmium-air, zinc-air and iron-air The use of platinum air cathodes in rechargeable systems. Performance data and problems in cell require further investigation. (Author)

PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

10/3 TYCO LABS INC WALTHAM MASS AD- 681 453

3 STUDY OF KINETICS OF ALKALI METAL DEPOSITION AND DISSOLUTION IN NONAQUEOUS SOLUTIONS.

DESCRIPTIVE NOTE: Final rept. 16 Aug 65-15 Aug 68, OCT 68 117P Cogley, David R.; Butler,

James N.; CONTRACT: AF 19(628)-5525 PROJ: AF-8659

MONITOR: AFCRL 68-0560

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*ELECTRODES, \*LITHIUM ALLOYS), (\*ELECTROLYSIS, REACTION KINETICS), (\*BATTERY COMPONENTS, ELECTROCHEMISTRY), SOLVENTS, SULFOXIDES, MERCURY ALLOYS, LITHIUM, SURFACE PROPERTIES, THERMODYNAMICS, CHACRIDES, FORMANIDES, ELECTROLYTES. (U)ELECTROLYTES IDENTIFIERS: AMMONIUM AMALGAM, DMSO(SULFOXIDE/DIMETHYL), LITHIUM CHLORIDE, ORGANIC BATTERIES, SULFOXIDE/DIMETHYL, THALLIUM(1) CHLORIDE

3 studies of the thallium amalgam-thallous chloride reference electrode, a review of electrochemistry in the solvent dimethyl sulfoxide, measurements of the of both lithium amalgam and solid lithium electrodes in abrotic organic solvents of high purity under were obtained separately from ohmic or mass-transfer solid lithium electrode is less than the rate obtained on a saturated lithium amalgam in the same electrolyte. Other investigations reported include Studies are described of the kinetics and mechanism sulfoxide, solubility of various salts in dimethyl From these measurements the kinetic parameters of electrodeposition of lithium on various substrate contributions by a galvanostatic pulse technique. controlled conditions. Activation overpotentials electron transfer reaction in LiCI-dimethyl sulfoxide were obtained. The observed exchange current in LiCl-DMSO of unit activity on a metals, purification and analysis of dimethyl thermodynamic activity of lithium in lithium amalgams, thermodynamics and kinetics of the tetraethyl ammonium amalgam electrode, sul foxide.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

10/3 681 243

LEESONA CORP GREAT NECK N Y LEESONA MODS LABS DIV

HIGH RATE PRIMARY ZINC/AIR BATTERY

3

DESCRIPTIVE NOTE: Final rept. 15 May 67-30 Jun 68 Katsoulis, Emanuel G. ; 46P 89 DEC

Randall, Bernard; CONTRACT: DAABO7-67-C-0432 PROJ: DA-1-T-622301-A-053

TASK: 1-T-622001-A-05302

0432-F MONITOR: ECOM

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*ZINC, \*ANODES(ELECTROLYTIC CELL)),
(\*PRIMARY BATTERIES, DESIGN), CATHODES(ELECTROLYTIC
CELL), AIR, COSTS, DESIGN, ELECTRICAL ENGINEERING,
STORAGE, MANUFACTURING, POTASSIUM COMPOUNDS, HYDROXIDES,
ELECTROLYTES, CATALYSTS, TEST METHODS
IDENTIFIERS: BICELL BATTERIES, METAL AIR BATTERIES,
POTASSIUM HYDROXIDE, \*ZINC AIR BATTERY CELLS
(1)

zinc-air battery. The major portion of this report is concerned with the battery testing, and activated design were fabricated and discharged at the maximum rated current of 2.5 amps at ambient temperatures. At 0F, 70F and 125F the battery delivered 16.7, 16.2 and 11.5 amp-hours respectively. The amp) requirement established for this battery. Anodes activated and stored at 125F for more than storage studies. Five-cell batteries of the final The report describes the work performed during a one-year program to develop a high rate, primary battery was also evaluated at the low rate (0.3 Six months exhibited an 18% capacity loss upon

battery yielded a materials cost of \$0.017 per watt-hour and an energy density of 113 watt-hours per and battery fabrication completed in the first three quarters is also included. The final optimized did not indicate significant capacity loss when discharged. A summary of the component development months at room temperature, and one month at 125F, discharge. Bicells activated and stored for two Pound. (Author)

UNCLASSIFIED

AD- 681 453

3 Sources Conference (22nd.), Session on Zinc-Silver Oxide Batteries, 14-16 May 68, 4p.
DESCRIPTORS: (\*ALKALINE BATTERIES, ARMY EQUIPMENT), WET CELLS, LIFE EXPECTANCY, PERFORMANCE(ENGINEERING), SILVER, ZINC, ELECTROLYTES, ELECTRODES
IDENTIFIERS: SILVER ZINC BATTERY CELLS
(U) SEARCH CONTROL NO. ZOMO7 Availability: Pub. in Annual Proceedings Power ARMY ELECTRONICS COMMAND FORT MONMOUTH N J Sulkes, Martin J. ; IMPROVED ARMY SILVER-ZING BATTERIES, UNCLASSIFIED REPORT DDC REPORT BIBLIDGRAPHY 4 4

developed that can be ready for use within 24 hours after filling. Improvements have been made to the Uncharged long life silver-zinc cells have been

3 BB-622/U battery so that cost per hour of service is less than 1/3 that of the original design.

Activation time for this battery has been reduced from approximately 2 weeks to 72 hours, with further reductions possible. In view of the foregoing results, the dry unchanged system would appear to be optimum for most Army applications requiring silver-zinc batteries. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/2

60/240 WATT HYDRAZINE FUEL CELL SYSTEM

3

Rogers, Leonard J. 46

MAY 68

UNCLASSIFIED REPORT

Availability: Pub. in Annual Proceedings Power Sources Conference (22nd.), Session on Fuel Cell-Battery Hybrid Systems, 14-16 May 68, 4p. DESCRIPTORS: (\*POWER EQUIPMENT, FUEL CELLS), (\*FUEL CELLS, PORTABLE EQUIPMENT), STORAGE BATTERIES, HYDRAZINE, AIR, DESIGN, CONTAINERS, ALKALINE BATTERIES

IDENTIFIERS: FUEL CELL BATTERY HYBRID SYSTEMS, MODULES, MICKEL CADMIUM BATTERIES

33

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> A portable hybrid fuel cell-storage battery system is described. Such a system allows short periods of high power drain from a nickel-cadmium battery which is recharged by a hydrazine air fuel cell. The casing, power output, electrical characteristics, and design are discussed.

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AD- 681 201

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ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N

SOLID ELECTROLYTE BATTERIES

3

Hull, Michael N.

# UNCLASSIFIED REPORT

Availability: Pub. in Annual Proceedings Power Sources Conference (22nd.), Session on Solid Electrolyte Batteries, 14-16 May 68, 4p.

DESCRIPTORS: (\*BATTERY COMPONENTS, \*MINIATURE ELECTRICAL EQUIPMENT), (\*ELECTROLYTES, SOLIDS), REVIEWS, PRIMARY BATTERIES, STORAGE BATTERIES, SILVER COMPOUNDS, CONDUCTIVITY, SULFUR COMPOUNDS, SILVER, FILMS, (U)FILMS

IDENTIFIERS: CHARGE TRANSFER COMPLEXES, \*SOLID

 $\Xi$ ELECTROLYTES

with conventional liquid electrolytes, interest has been reawakened in these power sources. Therefore the early development of solid electrolyte batteries of a family of solid ionic conductors with conductivities approaching that normally associated the extent of current research in this area are Until recently points in favor of solid electrolyte disadvantages, the greatest of which was the extremely low conductivity of the electrolyte. This meant that solid electrolyte batteries were capable of delivering flash currents in the low microampere range only. With the recent discovery

#### UNCLASSIFIED

DUC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMD7

3- 681 178 10/2 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N

INTEGRATED CELL STACKS,

3

Frysinger, Galen R. 44 89

# UNCLASSIFIED REPORT

3 3 Sources Conference (22nd). Session on Fuel Cell-Battery Hybrid Systems, 14-16 May 68, 4p.
DESCRIPTORS: (\*FUEL CELLS, DESIGN), (\*STORAGE BATTERIES, DESIGN), PORTABLE EQUIPMENT, ELECTRIC INSULATION, THERMAL INSULATION, LIQUID METALS, LITHIUM, POLARIZATION, ELECTRICAL ENGINEERING, ALKALINE BATTERIES, HALIDES, HYDROCARBONS, HYDROGEN, CARBON IDENTIFIERS: FOSSIL FUELS, FUEL CELL BATTERY HYBRID Availability: Pub. in Annual Proceedings Power MONOXIDE SYSTEMS

thermally and electrically integral cell stack of a fuel cell and storage battery which has very desirable characteristics for high efficiency pulse The paper discusses the uses and properties of a power systems.

3

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ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

NAVAL AVIONICS FACILITY INDIANAPOLIS IND

FORTRAN PROGRAM FOR STANDARD CELL DATA REDUCT ION

DESCRIPTIVE NOTE: Final rept.. AUG 68 49P Leonard,R. ;Ingels,John W.

NAFI-TR-1270

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, CALIBRATION), COMPUTER PROGRAMS, DATA PROCESSING, TEMPERATURE, VOLTAGE (U) IDENTIFIERS: FORTRAN, PRINTOUTS (U)

3 standardizing laboratories. A FORTRAN program complete with a sample problem is presented which may This report presents a basic program for reduction language, is adaptable for applications by other be adapted to the requirements of a calibration laboratory where computerized data reduction of of standard cell data through computerized techniques. The program, written in FORTRAN standard cell measurements is desirable. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DUC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/2

FUEL CELL MANPACK POWER SOURCE.

3

DESCRIPTIVE NOTE: Technical rept., 26P

3

NOV 68 26P Frysinger, Galen R. Wrublewski, Frank J.; Dudley, William L.;

REPT. NO. ECOM-3054 PROJ: DA-1-T-662705-A-053

1-T-662705-A-05304

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*FUEL CELLS, PORTABLE EQUIPMENT),
HYDRAZINE, AIR, STORAGE BATTERIES, BATTERY CHARGERS,
MINIATURE ELECTRICAL EQUIPMENT
IDENTIFIERS: FUEL CELL BATTERY HYBRID SYSTEMS,
HYDRAZINE AIR FUEL CELLS, NICKEL CADMIUM BATTERIES

3

Lightweight fuel cells coupled with secondary

batteries in a hybrid configuration constitute useful and versatile sources of power. The secondary battery provides required power density and instantly available power while the fuel cell efficiently continuous steady rate to sustain high energy density 30-watt system using a solid form of hydrogen, lithium hydride or sodium aluminum hydride, and a 60maximum operator simplicity. Electrical output characteristics are suitable for direct operation of electronic equipment with random duty cycles or for recharging secondary batteries. Development of a energy density making the hybrid fuel cell system competitive on cost per kilowatt hour with standard packaged for field supply, afford an extremely high military zinc-carbon primary batteries. (Author) converts a primary fuel to electrical power at a over extended missions. Miniaturized electronic controls enable automatic system operation for chemical fuel forms, which can be successfully (N2H4), has shown concept feasibility. These watt system using a liquid form, hydrazine

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AD- 680 894

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ZOMOZ DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 680 893

FEASIBILITY INVESTIGATION OF PLASTIC PARTS FOR VENTED, NICKEL-CADMIUM BATTERY BB-607( )/

Settembre, E. J. fechnical rept., NOV 68 20P REPT. NO. ECOM-3056 DESCRIPTIVE NOTE:

DA-1-T-662705-A-053 1-T-662705-A-05302 TASK: PROJ:

# UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*SICRAGE BATTERIES, \*PLASTICS), EXPANDED PLASTICS, THERMOSETTING PLASTICS. MOLDINGS, ISOCYANATE PLASTICS, EPOXY RESINS, ACRYLONITRILE POLYMERS, BUTADIENES, ACRYLIC RESINS, REINFORCED PLASTICS (UDENTIFIERS: NICKEL CADMIUM BATTERIES (U

3 assemblies in two configurations were constructed and evaluated. In these, the cell restraining clamp assemblies, battery hold-downs and battery cases were fabricated of plastics. Lower battery case corners were reinforced with eboxy and bulk voids were filled with urethane foam adding rigidity to the unit and supplying a shaped cavity for the cell assemblies. This report presents a feasibility investigation of the use of low cost and lightweight plastics for the BB-607( )/U Battery Assembly. Battery In addition, an inexpensive 'transit' cover was designed and fabricated. The completed unit weighs considerable weight saving. The battery assemblies were successfully drop-tested from four (4) feet 15.5 pounds, compared to 17.0 pounds for the conventional BB-607( )/U. This is a on a 2 in. fir bed backed by concrete.

#### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N AD- 680 169

STATE-OF-THE-ART ALKALINE CADMIUM ANODES.

3

Wagner, Otto C.; DESCRIPTIVE NOTE: Technical rept., 20P

DA-1-T-662705-A-053 TASK: 1-T-662705-A-05302 REPT. NO. ECOM-3047 PROJ:

68

>ON

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# UNCLASSIFIED REPORT

DESCRIPTORS: (\*ANODES(ELECTROLYTIC CELL), \*CADMIUM), (\*ALKALINE BATTERIES, ANODES(ELECTROLYTIC CELL)), CARBONATES, ELECTRIC DISCHARGES, IRON OXIDES, AIR IDENTIFIERS: CADMIUM AIR CELLS, NICKEL CADMIUM

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deliver 0.30 ampere-hours per gram of electrode at the C/5 rate. These anodes are of the sponge type and maintain 80-85% of theoretical capacity when continuously cycled at 100% depth of discharge Alkaline cadmium anodes have been developed to

interseparators between the anode and main separator (c) moderate overcharging during initial cycling, (C/5 rates of charge and discharge at room temperature). Loss of capacity of the cadmium anode is prevented by: (a) employment of 5-10% Fe203 or TiO2 extender, (b) elimination of carbonate within the unit cell, 2. Shorting by cadmium penetration through the elimination of carbonate within the unit cell, and (d) charging at rates between C/5 and C, and (c) keeping overcharge to a minimum. (Author) Separator system is prevented by: (a) (b) the employment of bibulous inert

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

- 679 699 10/3 22/2 NAVAL AMMUNITION DEPOT CRANE IND QUALITY EVALUATION 4D- 679 699

3 GENALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS - GENERAL PERFORMANCE TEST OF GENERAL ELECTRIC COMPANY 6.0 AMPERE-HOUR NICKEL-CADMIUM SECONDARY SPACECRAFT CELLS.

Mains, D. E. ; Bruess, E. 29P

C. : QE/C-68-926

# UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*STORAGE BATTERIES, ENVIRONMENTAL TESTS), (\*ALKALINE BATTERIES, ENVIRONMENTAL TESTS), NICKEL, CADMIUM, TESTS, VIBRATION, SHOCK RESISTANCE, ACCELERATION

ACCELERATION
IDENTIFIERS: NICKEL—CADMIUM CELLS

Presents the results of the general performance test of the General Electric Company 6.0 ampere-hour sealed nickel-cadmium secondary spacecraft cells. (Author)

#### UNCLASSIFIED

SEARCH CONTROL ND. DOC REPORT BIBLIOGRAPHY GLOBE-UNION INC MILWAUKEE WIS APPLIED RESEARCH LABS

IMMOBILIZED ELECTROLYTE FEASIBILITY STUDY.

3

DESCRIPTIVE NOTE: Final rept. 25 Jun-25 Dec 65, DEC 65 37P Simmons, G. L. ; Adler, R. W. ; Elliot, W. E. ; Towle, W. L. ; CONTRACT: DA-11-022-AMC-2236(T)

# UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*STORAGE BATTERIES, \*ELECTROLYTES), ELECTRODES, LEAD(METAL), SULFURIC ACID, WATER, GELS, POWDERS, SILICON DIOXIDE, FEASIBILITY STUDIES IDENTIFIERS: LEAD ACID CELLS, WATER ACTIVATED BATTERIES

3 The possibility of developing a water activated, lead acid battery is discussed. Chemical systems are described to which water may be added in a dry charge battery to produce sulfuric acid electrolyte. These include concentrated sulfuric acid immobilized in the form of gels on powders and chemicals that can hydrolyze to form sulfuric acid. It is indicated that experimental programs of varying length and complexity are needed to establish immediately most promising involves the use of concentrated sulfuric acid immobilized with pure silicon dioxide. (Author) the feasibility of any of the more promising approached. The approach that appears to be

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AD- 678 594

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AD- 679 699

AD- 676 867 10/3 ESB INC RESEARCH CENTER YARDLEY PA HIGH ENERGY SYSTEM (ORGANIC ELECTROLYTE). (U)

DESCRIPTIVE NOTE: Rept. no. 10 (Final), 15 Jun 62-15 Jun 68, OCT 68 125P Boden, D. P. ; Buhner, H. R. ; Spera, V. J. ; CDNTRACT: DAABOT-67-C-0385 PROJ: DA-1-C-014501-A-34-A

UNCLASSIFIED REPORT

0385-F

ECOM

MONITOR:

DESCRIPTORS: (\*STORAGE BATTERIES, ORGANIC MATERIALS),
ELECTRIC DISCHARGES, ELECTROLYTES, IMPURITIES, LITHIUM
COMPOUNDS, PERCHLORATES, OXYGEN HETEROCYCLIC COMPOUNDS,
KETONES, PURIFICATION, COPPER COMPOUNDS, FLUORIDES,
CATHODES(ELECTROLYTIC CELL), CHELATE COMPOUNDS, ORGANIC
SOLVENTS, ELECTROCHEMISTRY
CARBONATES: \*ORGANIC BATTERIES, PROPYLENE
(U)

The objective of the research were as follows:

(1) to determine the cause of self-discharge in activated Li/CuF2 cells, and to find a practical solution to the problem leading toward the realization of a non-reserve primary battery.

(2) To establish conditions for dry storage of Li/CuF2 cells which would provide a basis for the development of a reserve type cell. (3) Build and evaluate performance of 37 A.H. Li/CuF2 cells. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 676 106 10/3 DOUGLAS AIRCRAFT CO INC NEWPORT BEACH CALIF ASTROPOWER LAB STABLE INORGANIC MATRIX MATERIALS FOR HIGH
TEMPERATURE BATTERIES. (U)

DESCRIPTIVE NOTE: Final rept. no. 1, 2 Jun 67-2 Feb 68.

AUG 68 72P Arrance, Frank C.; Plizga M. J.; REPT. NO. DAC-60517-F CONTRACT: DAAB07-67-C-0456 PROJ: DA-1-C-622001-A-053 TASK: 1-C-622001-A-053-02 MONITOR: ECOM 0456-F

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, MATERIALS),
ELECTROLYTES, SALTS, ANODES(ELECTROLYTIC CELL), LITHIUM,
LITHIUM COMPOUNDS, POTASSIUM COMPOUNDS, CHLORIDES,
BATTERY SEPARATORS, MAGNESIUM OXIDES, THORIUM COMPOUNDS,
DIOXIDES, MAGNESIUM COMPOUNDS, ALUMINATES, CALCIUM
COMPOUNDS, ZIRCONATES, ALUMINUM COMPOUNDS, NITRIDES,
ELECTRIC PROPULSION
IDENTIFIERS: ALUMINUM COMPOUNDS, NITRIDES,
ZIRCONATE, MAGNESIUM ALUMINATE, \*MOLTEN ELECTROLYTE
BATTERIES, THÖRIUM(IV) OXIDE

The objective of the program was to prepare and evaluate inorganic formulations for applications as separators in high temperature batteries. In particular, this program emphasized materials that have the capability for sustained operation in fused salt electrolyte cells containing lithium anodes. Although the most important requirement for the inorganic separator was lithium compatibility, a satisfactory separator had to provide adequate electrode separation, low internal cell resistance, compatibility with the cathode, and resistance to degradation by the molten electrolyte. Promising inorganic separator formulations were tested for compatibility with lithium metal and LiCI-KCI fused salt electrolyte at 500C, and a number of physical properties were determined. These included electrical conductivity, ionic conductivity, and transverse strength.

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SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

3 EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT VENTED NICKEL-CADMIUM BATTERY ASSEMBLY BB-607()/

DESCRIPTIVE NOTE: Rept. no. 1 (Final), 23 Jun 66-30 Jul 67.

Carr, Earl S. ; CONTRACT: DA-28-043-AMC-02512(E) 68 110P

02512-F PROJ: DA-11641209D535 TASK: 1T641209D535-01 ECOM MONITOR:

# UNCLASSIFIED REPORT

3 ESCRIPTORS: (\*ALKALINE BATTERIES, DESIGN), STORAGE BATTERIES, ELECTRODES, NICKEL, CADMIUM, ELECTRICAL PROPERTIES, PERFORMANCE(ENGINEERING), TESTS, MECHANICAL

DENTIFIERS: \*NICKEL-CADMIUM CELLS

3 development and testing of the nickel cadmium battery assembly BB-607()/U. This battery assembly the other in the man-pack configuration. The battery assembly is rated at 24 volts and 5.5 amperenous or 12 volts and 11 ampereniours. Twenty-one battery assemblies were constructed and 16 were successfully tested to environmental and electrical report outlines the design and development program testing. The environmental tests included vibration, bounce and 4 in. drop testing of all corners, faces and edges with cover and simulated is a military-ruggedized design consisting of two and fully documents the battery assembly design. Complete drawings to L: AECOM format are included. tiers of BB-616()/U batteries stacked one above range of environmental and electrical tests. The well as artist's visualization of the battery 616()/U batteries were subjected to a complete equipment. In addition to these tests, 19 BB-The purpose of the contract was the design,

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

LEESONA CORP GREAT NECK N Y LEESONA MOOS LABS DIV 10/3

DEVELOPMENT OF ZINC/AIR 24 VOLT, 48 AMPERE-HOUR STANDARD LINE BATTERY SYSTEM.

3

Noorily, P. ; Staudinger, F. ; DESCRIPTIVE NOTE: Final rept. 15 Jun 67-29 Feb 68, CONTRACT: DA-28-043-AMC-02082(E) ECOM 02082-F AUG 68 49P MONITOR:

# UNCLASSIFIED REPORT

ZINC, ELECTROLYTES, AIR, BATTERY SEPARATURS, BATTERY COMPARTMENTS, PERFORMANCE(ENGINEERING), LIFE EXPECTANCY, POWER SUPPLIES, TRANSMITTER RECEIVERS

(DENTIFIERS: \*ZINC AIR BATTERY CELLS (\*STORAGE BATTERIES, DESIGN', ELECTRODES, DESCRIPTORS:

for the development of a versatile battery system capable of delivering 48 ampere-hours within a weight addition to all cells and full capacity is obtained been tested on three duty cycles at various ambient temperatures (0F, 70F and 125F). These obtained at room temperature on a battery having up a new military family of batteries. Batteries have been designed, fabricated and tested. The battery weight is 14.8 pounds and the system has a maximum current capability of 10 amperes. This system has standard line battery cross section. The standard line battery cross section (length 12 in, width 4 in, height 9 in) represents a size designation for to 150 hours of operation. Repeated cycling of the oss of water can be replenished by a simple water loss of water evaporation from the cells and a lowering of the electrochemical performance. This battery beyond this point results in an increased Re-addition of water also has the advantage that full capacity can be delivered at the high development of a 48 ampere-hour zinc/air battery The report covers the work performed toward the restriction of 15 pounds and conforming to the tests have indicated that full capacity can be system conforming to the Electronics Command Technical Requirement SCL 6895 amendment 1 dated April 20, 1967. This requirement called emperature point (+125F).

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PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

- 673 717 10/2 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 673 717

3 PORTABLE MILITARY CHARGER FOR ZINC-SILVER OXIDE BATTERIES.

DESCRIPTIVE NOTE: Technical rept.,
JUL 68 17P Pilla, Louis J.
REPT. NO. ECOM-2988
PROJ: DA-12640909D513

PROJ:

126409090513-02

# UNCLASSIFIED REPORT

(\*STORAGE BATTERIES, SEARCH RADAR), PORTABLE EQUIPMENT, GENERATORS, ZINC, SILVER COMPOUNDS, OXIDES, ELECTRIC CURRENTS, WEIGHT, EFFICIENCY, SYNCHRONIZATION(ELECTRONICS), COMBAT SURVEILLANCE, SILICON CONTROLLED RECTIFIERS (U) IDENTIFIERS: AN/PPS-5, ZINC-SILVER OXIDE CELLS (U) DESCRIPTORS: (\*BATTERY CHARGERS, SEARCH RADAR)

33

compatibility between the battery and existing forward area engine generator sets. Proper charging of the zinc-silver oxide battery is a highly specific process. To maintain full charge capability and insure maximum cycle life, the battery must be charged with a controlled constant current at the 10-hour rate. When the battery reaches its end of charge voltage of 2.01 to 2.05 volts/cell, it is fully charged; the PP-4127A/U will then hour period through the use of two separate channels. U will charge two batteries simultaneously in a 10power source is a 6-volt, 60-Ah zinc-silver oxide battery. The battery charger provides PPS-5 is a portable battery operated system. The provide battery charger support for the Ground Surveillance Radar Set AN/PPS-5; the AN/ discontinue the charging cycle. The PP-4127A/ Battery Charger PP-4127A/U was designed to

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMD? DDC REPORT BIBLIOGRAPHY

HARRY DIAMOND LABS WASHINGTON D C 10/3 AD- 673 701

THE THERMAL REACTION BATTERY. PART II. PREPARATION AND PYROLYSIS OF SOME AROMATIC HYDRAZONES AND HYDRAZONIUM SALTS.

3

Dewey, Fred M. ; JUN 68 27P Dewey,Fre REPT. NO. HDL-TR-1398 PROJ: DA-1N523801A300, HDL-96300

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*THERMAL BATTERIES, ORGANIC MATERIALS), AROMATIC COMPOUNDS, HYDRAZONES, SALTS, ELECTROLYTES, PYROLYSIS, ORGANIC SOLVENTS, BENZALDEHYDES, BENZONITRILES, AMMONIUM COMPOUNDS, SYNTHESIS(CHEMISTRY)

IDENTIFIERS: \*ORGANIC BATTERIES

33

yield permanently liquid solvents for ionizable salts that benzaldehyde phenylhydrazone undergoes pyrolysis to give benzonitrile, and that acidic reagents accelera a the reaction. Benzaldehyde trimethylhydrazonium salts were found to undergo rapid cleavage at 230-240C, giving benzonitrile and a trimethylammonium salt as major products. Hence, Organic compounds that can be thermally degraded to the hydrazonium salts are promising candidates for for use in the proposed thermal reaction battery continue to receive attention. It was confirmed use as electrolyte carriers. (Author)

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It is portable, fully militarized and operational with 115/230 v, 50/60- and 400-Hz power sources. Its overall weight is 40.5 pounds and its efficiency is 53%. (Author)

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 673 399 10/3 NAVAL RESEARCH LAB WASHINGTON D C CHARACTERISTICS OF AN IMPROVED INERT-CATHODE/
MAGNESIUM-ANDDE SEA-WATER BATTERY, (U)

JUN 68 24P Wilson,B. J.; REPT. NO. NRL-6715 PROJ: A37-533-096/652-1/F101-13-01

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*WATER ACTIVATED BATTERIES, DESIGN),
CATHODES(ELECTROLYTIC CELL), MAGNESIUM,
ANODES(ELECTROLYTIC CELL), STEEL, NICKEL ALLOYS,
PALLADIUM ALLOYS, CORROSION, STORAGE, LIFE EXPECTANCY,
SONOBUDYS, UNDERWATER EQUIPMENT, POWER SUPPLIES,
ELECTROLYTES, SEA WATER BATTERIES
(U)

The inert-cathode/Mg-anc'e sea-water battery has demonstrated the capability to furnish power, generally in conjunction with a dc-dc converter, for a variety of marine underwater devices. A battery of this sort may be tailored to application and its performance predicted to within 10 to 20% of actual. Shelf life is long, upward from several years, on the basis of experience and materials. This shelf life presumes storage without the electrolyte and refrigeration. One exception exists in the case of the impulse cell where exposed storage periods in the order of 1 year lessens the magnitude and rate of cell response upon activation and the energy supplied over a given interval storage periods in the order of 1 year lessens the magnitude and rate of cell response upon activation and the energy supplied over a given interval. Such loss may generally be compensated by initially allowing a greater margin of power. Operating life is adversely affected by accumulations of reaction products and varies with electrode spacing and current density. More than 60 days of continuous operation have been acnieved at the reduced current density of about 1 ampere per square foot. Seriesbattery terminal voltages of about 1.5 volts are conveniently achieved in the interests of compactness and converter efficiency. Higher voltages in series systems are achieved with greater cell (U)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 672 610 7/4 10/3 TYCO LABS INC WALTHAM MASS SOLUBILITY AND COMPLEX FORMATION EQUILIBRIA OF SILVER CHLORIDE IN PROPYLENE CARBONATE-WATER MIXTURES, (U)

JAN 68 9P Butler, James N.; Cogley, David R.; Zurosky, Walter;

David R.; Zurosky, Walter; REPT. NO. Scientific-2 CONTRACT: AF 19(628)-6131

PROJ: AF-8659 TASK: 865904 MONITOR: AFCRL 68-0342

# UNCLASSIFIED REPORT

Availability: Pub. in Jul. of the Electrochemical Society, v115 n5 p445-449 May 68. SUPPLEMENTARY NOTE: Revision of report dated 1 Nov

DESCRIPTORS: (\*ELECTRODES, SILVER COMPOUNDS), (\*SILVER COMPOUNDS, SOLUTIONS(MIXTURES)), (\*COMPLEX COMPOUNDS, SIL &R COMPOUNDS), CHCRIDES, CHEMICAL EQUILIBRIUM, ELECTROCHEMISTRY, SOLVENTS, OXYGEN HETEROCYCLIC COMPOUNDS, KETONES, WATER, BATTERY COMPONENTS, ELECTRIC BATTERIES, ORGANIC MATERIALS IDENTIFIERS: ORGANIC BATTERIES, PROPYLENE CARBONATES, (U) SILVER CHLORIDE

The solubility and complex formation equilibria of silver chloride in propylene carbonate-water mixtures (0.004 to 3.57 M H2D) were studied potentiometrically in a constant ionic medium of 0.1 m tetraethylammonium perchlorate, at 255. The complexes are predominately mononuclear, and the principal species in solution is AgC12(-). The over-all complex formation constants decrease and the solubility product increases with increasing water concentration. The intrinsic solubility of AgC1 is essentially independent of the water content of the solvent.

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AD- 672 610

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 671 422 10/3
OREGON STATE UNIV CORVALLIS DEPT OF CHEMICAL ENGINEERING

A HIGH-TEMPERATURE SOLID-STATE BATTERY,
68 SP Clark, Dwight P. ; Meredith,

3

# UNCLASSIFIED REPORT

Reprint-83

Availability: Published in Electrochemical Technology, v5 n9/10 p446 1967.

DESCRIPTORS: (\*BATTERY COMPONENTS, MATERIALS), (\*ZIRCONIUM OXIDES, \*ELECTROLYTES), SOLIDS, STABLIZATION, ADDITIVES, CALCIUM OXIDES, ANDDES(ELECTROLYTIC CELLS), IRON NICKEL, MANGANESE, COBALT, CATHODES(ELECTROLYTIC CELLS), PLATINUM, OXYGEN, FEASIBILITY STUDIES, (U)FEASIBILITY STUDIES

The investigation was concerned with the feasibility of using a solid calcia-stabilized zinconia electrolyte in a battery with a solid metallic anode and a solid-gaseous cathode and operating at a temperature of approximately 1000c. The cathode consisted of a thin porous platinum electrode in an oxygen-containing atmosphere. A thin film of metal deposited on the opposite face of the film of metal deposited on the opposite face of successfully investigated were iron, nickel, manganese, and cobalt, and typical discharge curves are presented. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MO7

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT
MAGNESIUM/MAGNESIUM PERCHLORATE/MANGANESE DIOXIDE
BATTERIES FOR FIELD RADIO APPLICATIONS. (U)

DESCRIPTIVE NOTE: Final rept. Nov 66-Feb 68, JUN 68 98P Cupp, Earl B.; CONTRACT: DAAB07-67-C-0116 PROJ: DA-116-22001-A-053 TASK: 116-22001-A-053-02 MONITOR: ECOM 0116-F

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*WET CELLS, DESIGN), (\*PRIMARY BATTERIES, DESIGN), ELECTRODES, MAGNESIUM, MANGANESE COMPOUNDS, DIOXIDES, MAGNESIUM COMPOUNDS, PERCHLORATES, ELECTROLYTES, PERFORMANCE(ENGINEERING), ELECTRICAL PROPERTIES, LIFE EXPECTANCY, ENVIRONMENTAL TESTS, TRANSMITTER RECEIVERS, POWER SUPPLIES IDENTIFIERS: AN/PRC-62, MAGNESIUM PERCHLORATE, (U) MANGANESE(IV) OXIDE, RESERVE BATTERIES

The report describes the significant accomplishments made toward meeting the design goals for the Type 62 battery. The design effort directed toward lighter battery weight, nonspill features, activated storage and control of battery expansion are described in detail. The report concludes with the testing of a final 6.5 pound battery design which should meet the requirements for the Type 62 battery. (Author)

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PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

AD- 670 733

NAVAL RESEARCH LAB WASHINGTON D C

EFFECTS OF CONSTANT-CURRENT REVERSALS DURING CHARGE OF THE SILVER OXIDE ELECTRODE,

Wales, Charles P. 20 P 68

REPT. NO. NRL-6695 PROJ: SF013-06-03-4366, RR001-01-43-4755

# UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*ALKALINE BATTERIES, ELECTRODES), (\*ELECTRODES, SILVER COMPOUNDS), OXIDES, STORAGE BATTERIES, ELECTRIC DISCHARGES, BATTERY CHARGERS IDENTIFIERS: SILVER ZINC BATTERY CELLS, SILVER

partly discharging the silver electrodes the first one or two times that the potential reached a chosen value near the end of a charge. In general, capacity improvement decreased as KOH concentration A large capacity increase was obtained when the charge current was reversed for 15 min out of every 60 min during a charge at the 20-hr rate, but this method greatly increased the total time required for a charge. Capacity could be improved a smaller amount, without charge time becoming excessive, by batteries were changed by a constant current, interrupted by period: constant-current discharge. increased. Commercial silver-zinc cells always gave less improvement than the test cells. The sintered silver electrodes used in storage (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

- 669 994 10/2 10/3 22/2 JOHNS HOPKINS UNIV SILVER SPRING MD APPLIED PHYSICS AD- 669 994

DODGE SATELLITE POWER SYSTEM.

3

Wilson, Louis ; DESCRIPTIVE NOTE: Technical memo., MAY 68 39P REPT. NO. APL-TG-978 CONTRACT: NOW-62-0604

### UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*SCIENTIFIC SATELLITES, ELECTRIC POWER PRODUCTION), (\*SOLAR CELLS, \*STORAGE BATTERIES), GRAVITY, STABILIZATION, DAMPING, MAGNETIC FIELDS, HYSTERESIS, INVERTERS, DC TO DC CONVERTERS, VOLTAGE, ELECTRIC CURRENTS, ATTITUDE CONTROL SYSTEMS, DIAGRAMS, POWER SUPPLIES
IDENTIFIERS: DEPARTMENT OF DEFENSE GRAVITY EXPERIMENT, DODGE (DEPARTMENT OF DEFENSE GRAVITY EXPERIMENT), DODGE SATELLITE

subsystems. The solar power generating capability is 45 watts (average). A 6-ampere-hour 10-volt nickel-cadmium battery operates peak electrical loads designed, as an experiment to demonstrate two- and three-axis gravity-gradient stabilization using magnetic and hysteresis damping techniques. A solar cell/battery power system furnishes all of the electrical energy required to operate the satellite safeguarding the battery against excessive discharge currents and charging voltages. (Author) Experiment) satellite was launched on July 1, 1967 to an altitude of 18,000 statute miles into a required to operate the on-board electrical loads. during light and dark orbits as required. DC-to-The power system contains protective devices for AC inverters and DC-to-DC converters transform the solar/battery voltage to the proper levels near-synchronous orbit. The satellite was The DODGE (Department of Defense Gravity

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AD- 669 994

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

TRW SYSTEMS REDONDO BEACH CALIF 10/3

3 VOLTAMMETRIC STUDIES OF NON-AQUEOUS SYSTEMS.

DESCRIPTIVE NOTE: Final rept. no. 2, 1 Jul 66-31 Aug Fogle, R. F. ; Seo, E. T. ; CONTRACT: DA-28-043-AMC-02464(E) 122P Silverman, H. P. : DEC 67

PROJ: DA-1-C-014501-A-34-A

MONITOR: ECOM 02464-F

# UNCLASSIFIED REPORT

3 3 (\*ELECTROCHEMISTRY, ORGANIC COMPOUNDS), ORGANIC SOLVENTS, ELECTROLYTES, OXIDIZERS, ORGANIC NITROGEN COMPOUNDS, INTROBENZENES, NITROPHENOLS, TOLUENES, ALKANES, CHLORINE COMPOUNDS, LITHIUM, LITHIUM COMPOUNDS, PERCHLORATES, CATHODES(ELCTROLYTIC CELL), OXYGEN HETEROCYCLIC ANODES(ELECTROLYTIC CELL), OXYGEN HETEROCYCLIC COMPOUNDS, KETONES, BINDERS, ACRYLIC RESINS, MANUFACTURING, STONESE (U)STORAGE ( DESCRIPTORS: (\*BATTERY COMPONENTS, ORGANIC MATERIALS),

Voltammetric studies of the reduction of organic compounds in organic solvents were undertaken as part of a program to develop high-energy density organic as a major diagnostic tool for evaluating organic oxidizing agents as possible high-energy density cathode materials, and to elucidate the mechanisms of a heterogeneous electron transfer and any homogeneous follow-up chemical reactions. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

LEESONA CORP GREAT NECK N Y LEESONA MOOS LABS DIV 10/3

3 DEVELOPMENT OF 24 VOLT, 25 AMPERE-HOUR AND 60 WATT, 720 WATT-HOUR ZINC/AIR BATTERY SYSTEMS.

DESCRIPTIVE NOTE: Technical rept. no. 1, 16 Mar 66-16

APR 58 79P Jagid,B.;Staudinger,F.; CONTRACT: DA-28-043-AMC-02082(E) PROJ: DA-1-T-622001-A-053 TASK: 1-T-622001-A-05302

02082-1 MONITOR: ECOM

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), ELECTRODES, ZINC, ELECTROLYTES, AIR, BATTERY SEPARATORS, PERFORMANCE(ENGINEERING), ELECTRICAL PROPERTIES, TRANSMITTER RECEIVERS, PORTABLE EQUIPMENT, POWER IDENTIFIERS: AN/PRC-47, AN/PRC-41, \*ZINC AIR BATTERY SUPPLIES

conforming to the Electronics Command Technical Requirements SCL 6895 and SCL 6896. SCL 6895 calls for the development of a 60 watt-720 watt-hour zinc/air battery with the capability of voltage selection in the range of 8, 16, 24 and 32 volts. Technical Specification SCL 6896 required the batteries to power radio sets AN/PRC-41 and AN/PRC-47. The design target weight of this latter system is 10 pounds within the physical dimensions of length-11-5/8 in. width-4-3/16 in. and height-7-3/4 in. Voltage regulation was specified as 22 to 28 indicated that the 24 volt, 25 ampere-hour system can development of two separate zinc/air battery systems deliver rated capacity. Mechanical rechange of the system was demonstrated and was performed in less design, fabrication and evaluation of z nc/air The report describes work performed toward the volts. The two battery systems were designed, be discharged repeatedly (more than 20 times) against the AN/PRC-47 transceiver and still fabricated and evaluated. Tests performed

AD- 668 691

present time.

267

than the 10 minute requirement. Life studies were performed at LML and indicate that a battery life in excess of 50 recharges should be obtainable at the

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 668 654 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J STANDARD ALKALINE CELLS AND SECONDARY BATTERIES. (U

MAR 68 31P Settembre, Erminio J.; PT. NO. ECOM-2949 Out DA-3522001.353

PROJ: DA-1:622001..353

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, STANDARDIZATION),
(\*STORAGE BATTERIES, STANDARDIZATION), ELECTRODES,
NICKEL, CADMIUM, ZINC, SILVER COMPOUNDS, OXIDES,
CONTAINERS, GLASS TEXTILES, FASTENERS, ELECTRIC
CONNECTORS, CONFIGURATION, MINIATURE ELECTRICAL
EQUIPMENT, DESIGN, ELECTRICAL PROPERTIES
IDENTIFIERS: NICKEL-CADMIUM CELLS, SILVER ZINC BATTERY
CELLS

The physical and electrical characteristics for a family of cells and batteries of the Nickel-Cadmium-Silver Oxide and Zinc-Silver Oxide electrochemical systems are presented. Four cell sizes exist for each system which are used in standard batteries of man-pack and detached configurations. Standard batteries are noused in fiberglas reinforced plastic cases designed requirements. The flexibility and interchangeability to be derived from standard batteries was enhanced by incorporating in each batteries was enhanced by incorporating in each batteries was enhanced by incorporating and two capacity levels. Design, physical and electrical characteristics, availability and future plans are presented. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 667 579 10/3 13/10
CDAST GUARD WASHINGTON D C TESTING AND DEVELOPMENT
DIV

EDISON BY BATTERIES IN BUDYS.

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DESCRIPTIVE NOTE: Final rept.,
68 27P Montonye,J. T.;
PROJ: J16/1-1-8(a)

### UNCLASSIFIED REPORT

Availability: Microfiche only after original copies exhausted.
DESCRIPTORS: (\*BUDYS, \*PRIMARY BATTERIES), ENVIRONMENTAL TESTS, LIFE EXPECTANCY, ELECTRICAL PROPERTIES, NAVIGATIONAL LIGHTS, POWER SUPPLIES (U)

Controlled and monitored service tests of Edison BY batteries, an air-depolarized primary cell with liquid electrolyte that was specifically designed for use on aids to navigation buoys, began in 1964. This final report presents the results of the tests concerning capacity, the effects of age on capacity, and the effect of air starvation on capacity. Additionally, recommendations are made stressing procedures that should facilitate accurate calculation of capacity in future in-service battery (U) evaluations. (Author)

PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

- 666 790 10/3 BURGESS BATTERY CO FREEPORT ILL

DEVELOPMENT OF MAGNESIUM WAFER CELLS.

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Semiannual rept. 1 May-31 Oct 67, FEB 68 30P Eaton, Lloyd W.; CONTRACT: DA-28-043-AMC-02135(E) PROJ: DA-116-22001-A-053 TASK: 116-22001-A-053-02 02135-5 DESCRIPTIVE NOTE: MONITOR: ECOM

### UNCLASSIFIED REPORT

33 SUPPLEMENTARY NOTE: See also AD-661 642.
DESCRIPTORS: (\*PRIMARY BATTERIES, \*MAGNESIUM), (\*DRY BATTERIES, MAGNESIUM), FAILURE(ELECTRONICS), CORROSION, ELECTRODES, BATTERIES, THERMAL STABILITY, STORAGE, MATERIALS, PROTECTIVE COVERINGS

DENTIFIERS: \*MAGNESIUM WAFER CELLS

3 batteries has been the degree of corrosion of the magnesium anode on the contact side that progresses under the cell wrap seal and increases the resistance of the contact or destroys the contact. It has been concluded that the presence of air is causing the anode to be attacked on the contact (nonsuggestion that the rubber hydrochloride cell wrap is anode in a flat cell needs complete protection on the reactive) side to an excessive degree and that the material seems to intensify the action on the nonnon-reactive side. Magnesium perchlorate cathode reactive side of the ahode and there is a strong being degraded by the oxidizing nature of the perchlorate at 160F. causing leakage and the destruction of the batteries stored at 160F. The principal failure of magnesium bromide

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ESB INC RESEARCH CENTER YARDLEY PA AD- 666 230

3 HIGH ENERGY SYSTEM (ORGANIC ELECTROLYTE).

DESCRIPTIVE NOTE: Semi-annual rept. no. 9, 15 Jun-15 Boden, D. P. ; Buhner, H. 79P 89 Dec 67, FEB

R. ;Spera,V. J. ; CONTRACT: DAABO7-67-C-0385 PROJ: DA-1C014501A34A

0385-1 MONITOR:

# UNCLASSIFIED REPORT

3 CATHODES(ELECTROLYTIC CELL), COPPER COMPOUNDS, FLUORIDES, LITHIUM, LITHIUM COMPOUNDS, PERCHLORATES, STORAGE, LIFE EXPECTANCY, ORGANIC SOLVENTS, ETHYLENES, CARBONATES, GRAPHITE, ADDITIVES, ELECTROCHEMISTRY IDENTIFIERS: ETHYLENE CARBONATES, LITHIUM PERCHLORATE, \*ORGANIC BATTERIES, PROPYLENE CARBONATES, SEQUESTERING SUPPLEMENTARY NOTE: See also AD-659 419.
DESCRIPTORS: (\*WET CELLS, ORGANIC MATERIALS),
(\*ELECTROLYTES, ORGANIC MATERIALS), AGENTS

Constitution of the soluble copper species in organic and activated storage capability of the CuF2 cell was evaluated under both vacuum and dry argon storage New solvents and solvent mixtures were evaluated in an effort to develop an improved electrolyte. New conductive additives were evaluated in order to determine their effect on the discharge efficiency and propylene carbonate were submitted to extensive activated storage and discharge rate capabilities. The major efforts in the present investigations Storage limitations, it was thought that certain was specially treated to remove traces of water. mercury pool cell was employed to determine the Concerned with attempts to alleviate the aboveimpurities in the electrolyte components might The results of previous studies of the Li/ CuF2 couple indicated that the major problems conditions. A voltammetric technique, using a Purification procedures. In addition, LiC104 remaining to be solved were in improving the mentioned problems. In the case of activated Promote dissolution of CuF2. Both LiC104

electrolyte.

AD- 666 230

UNCLASSIFIED

ZOMO2

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SEARCH CONTROL NO. MENGRY BIBLIOGRAPHY

10/3

MURGESS BATTERY CO FREEPORT ILL

3 WAGNESIUM ROUND DRY CELL BATTERIES.

DESCRIPTIVE NOTE: Rept. no. 1 (Final), 1 Jul 66-30 Jun 67

FEB 68 82P Messing, Terry G. CONTRACT: DA-28-043-AMC-02572(E)

PROJ: DA-IT6-22001-A-053

02572-F ECOM MUNITOR:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*DRY BATTERIES, DESIGN), PRIMARY BATTERIES, MAGNESIUM, MANGANESE COMPOUNDS, DIOXIDES, SEALS, ELECTRICAL PROPERTIES, PERFORMANCE(ENGINEERING) NONDESTRUCTIVE TESTING

3 characteristics and capacities after extended periods give a nondestructive test of a magnesium cell is Discussion of the development of a magnesium dry cell with a mechanical seal is given. Data is of storage. Use of certain measuring circuits to shown describing this cell's delay time shown. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ELECTRIC STORAGE BATTERY CO MADISON WIS RAY-0-VAC DIV

3 DESCRIPTIVE NOTE: Semiannual rept. no. 5, 1 May-31 Oct DEVELOPMENT OF MAGNESIUM FLAT CELL BATTERY

CONTRACT: DA-28-043-AMC-02136(E)
PRDJ: DA-116-22001-A-053
TASK: 176-22001-A-053-02
MONITOR: FORM

# UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*PRIMARY BATTERIES, MAGNESIUM), (\*DRY BATTERIES, MAGNESIUM), (\*DRY BATTERIES, MAGNESIUM), ELECTROLYTES, MAGNESIUM COMPOUNDS, BROMIDES. PERCHLORATES, MANGANESE COMPOUNDS, DIOXIDES, PERFORMANCE(ENGINEERING), ELECTRICAL PROPERTIES, STORAGE IDM BROMIDES, MAGNESIUM PERCHLORATE, MAGNESIUM OXIDE SUPPLEMENTARY NOTE: See also AD-657 588

presented on the statistically designed series of batteries assembled to improve capacity after high temperature storage. A repeat run of the best log using each the magnesium bromide and magnesium perchlorate electrolyte was made and initial and delayed BA-399 capacity data are presented. The first series using a larger size flat cell was assembled for use in the BA-386 battery. This quantity found most advantageous in the BA-399 Dattery. (Author) series used the electrolyte concentration and Initial and delayed BA-399 capacity data are

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AD- 666 184

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ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

DOUGLAS AIRCRAFT CO INC NEWPORT BEACH CALIF ASTROPOWER AD- 665 631

 $\Xi$ SEPARATORS FOR HIGH-RATE, NON-RESERVE ZINC-SILVER OXIDE BATTERIES.

Final rept. 20 Feb-19 Nov 67 Himy. A. ; DAAB07-67-C-0310 PROJ: DA-1-C-622001-A-053 TASK: 1-C-622001-A-05302 0310-F DAC-59852-F 115P DESCRIPTIVE NOTE: ECOM REPT. NO. MONITOR: CONTRACT

# UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*ALKALINE BATTERIES, BATTERY SEPARATORS), (\*BATTERY SEPARATORS, ALKALINE BATTERIES), ZINC, SILVER COMPOUNDS, OXIDES, INORGANIC COMPOUNDS, FILMS, ELECTRICAL PROPERTIES, COMPATIBILITY, PREPARATION, ELECTRODES, BINDERS, ME:"BRANES, COMPOSITE MATERIALS, (U) IDENTIFIERS: SILVER ZINC BATTERY CELLS

3 producible film. Emphasis was placed on selecting an optimum inorganic material and formulating several inorganic-organic composites, accompanied by a series of evaluations designed to satisfy the requirements outlined above. Finally, the most favorable complete the evaluation. The report provides a description of the results obtained during the course separator materials for high rate, nonreserve, zincsilver oxide batteries for obtaining a readily interpretations are also presented and experimental systems were subjected to actual cell tests to The purpose of the program was to investigate of the program. Separator mechanistic procedures are described.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL ORDNANCE LAB WHITE DAK MD 10/3

THE CONTROL OF INSOLUBLE MAGNESIUM COMPOUNDS RESULTING FROM SEA WATER BATTERY OPERATION,

3

Mueller, Carl E. ; Bowers, REPT. NO. NOLTR-67-120 PROJ: MAT-03L-000/F008-98-01-P019 25P Frederic M. ; 67

### UNCLASSIFIED REPURT

3 3 DESCRIPTORS: (\*SONOBUOYS, BATTERY COMPONENTS), (\*BATTERY COMPONENTS, CORROSION INHIBITION), ELECTHODES, SILVER COMPOUNDS, CHLORIDES, MAGNESIUM, CORROSION, FLECTROLYTES, SEA WATER, MAGNESIUM COMPOUNDS, FLUID FILTERS, THALLIUM COMPOUNDS, FLUORIDES, CHEMICAL PRECIPITATION, ETHYLENEDINITRILO TETRAACETATES, COMPLEX COMPOUNDS, (U)COMPLEX COMPOUNDS MAGNESIUM CELLS, THALLIUM FLUORIDES

3 flocculent precipitate that clogs the inlet ports and discharged in 3.5% salinity sea water and showed capacity increases ranging from 12 to 60 percent over batteries having no filter. With TIF filters the capacity increase was typically 12 percent and fills the space between the electrodes. The results of this investigation show that the flocculent precipitate is formed only when magnesium ions (Mg(++)) are initially present in the electrolyte solution. In magnesium free salt solutions, with a salinity equal to sea water, the magnesium sea water batteries is often limited by a can be controlled by passing the incoming sea water The capacity of low rate multicell silver chloride/ electrolyte through a filter of thallous fluoride water electrolyte apparently react with the TIF to form a granular precipitate, and with disodium precipitate is granular. The magnesium-ion effect Batteries containing filters of these types were with disodium EDTA the increase was typically 45 (disodium EDTA). The magnesium ions in the sea (TIF) or disodium ethylenediaminetetraacetate EDTA to form a soluble magnesium complex. percent. (Author)

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SEARCH CONTROL NO. ZOMOT DDC REPORT BIBLIDGRAPHY

MELPAR INC FALLS CHURCH VA

LOW COST ORDNANCE FOWER SUPPLY,

3

DESCRIPTIVE NOTE: Final rept., FEB 68 41P Finkel, J. R. ;McCabe, P. 5501 DA-49-186-AMC-268(D) HDL-96094 MONITOR: HDL Š CONTRACT:

# UNCLASSIFIED REPORT

3 AMMONIUM COMPOUNDS. THIOCYANATES, ELECTROLYTES, AMMONIUM COMPOUNDS. THIOCYANATES, ELECTROLYTES, ANODES(ELECTROLYTIC CELL), MAGNESIUM, STAINLESS STEEL, BATTERY SEPARATORS. GLASS TEXTILES, CATHODES(ELECTROLYTIC CELL), NITROBENZENES, CARBON BLACK, METHYL CELLULOSE IDENTIFIERS: AMMONIA-AC IVATED BATTERIES, \*RESERVE

3 BATTERIES, STEEL 1050, THIOCYANATE/AMMONIUM

second and to produce an output of 30 plus or minus 6 volts for 120 seconds at a steady current drain of 15 liquid ammonia as the electrolyte, a magnesium anode, activated by combined linear and rotary acceleration forces that cause the electrolyte reservoir to be ruptured, driving the solution into the cell stack. They are designed to be activated in less than 0.5 stainless steel collector and fiberglass separators, and a composite cathode of m-dinitrobenzene, carbon mA with a 15-second-duration maximum current drain The preliminary and prototype designs of a liquidblacks, and methyl cellulose. The batteries are quantity are presented. The prototype batteries utilize: a solution of ammonium thiocyanate in discussed, and cost estimates for production in ammonia-activated reserve primary battery are of 150 mA. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT

DEVELOPMENT OF THE HARP BATTERY. DESCRIPTIVE NOTE:

3

Final rept., P Broglio, Edward P. CONTRACT: DA-49-186-AMC-295(X) 70P 92049 PROJ:

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*SABOT PROJECTILES, BATTERY COMPONENTS), (\*ALKALINE BATTERIES, DESIGN), MINIATURE ELECTRICAL EQUIPMENT, STORAGE BATTERIES, ELECTRODES, SILVER, ZINC, BATTERY SEPARATORS, CONTAINERS, ATMOSPHERIC SOUNDING, HIGH ALTITUDE, (U)HIGH ALTITUDE RESEARCH PROGRAM), SILVER ZINC BATTERY CELLS

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3 electrical performance is outlined. The report contains operating and charging instructions for the design is presented in detail along with the design The development of a miniature sealed silver-zinc rechargeable battery for high altitude research program is outlined. Details concerning the parameters for the active battery components. The battery, typical performance characteristics and solution of design problems both mechanical and selection of the successful design concept are presented. The evolution of the battery case drawings. (Author)

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

NAVAL RESEARCH LAB WASHINGTON D C AD- 664 827

3 THE PLATE MATERIALS OF THE LEAD-ACID CELL. PART 3-ANODIC OXIDATION OF TETRAGONAL PBO.

SF-013-06-06-4366, RR-001-01-43-4755 Burbank, Jeanne; DESCRIPTIVE NOTE: Final rept., NRL-6613-Pt-3 24P REPT. NO.

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-644 599.

DESCRIPTORS: (\*STORAGE BATTERIES, ELECTRODES),

(\*ELECTRODES, OXIDATION), ANODIC COATINGS, LEAD
COMPOUNDS, OXIDES, CRYSTAL STRUCTURE, X RAY DIFFRACTION,
CHEMICAL PROPERTIES, ELECTRICAL PROPERTIES, CRYSTAL
LATTICES, CHEMICAL REACTIONS, ELECTROCHEMISTRY,
LEAD(METAL), SULFURIC ACID
IDENTIFIERS: LEAD ACID CELLS, LEAD OXIDES
(U)

diffraction examination of the anodic product showed that it was neither of the known polymorphs of determine which if either of these possibilities is the actual structure. (Author) possibilities for the logical placements of the additional oxygen in the lattice are the fluoriterelated LaOF and the PDFC1 layer structure anodized in H2SO4 solution at room temperature, and became converted to a dark-brown-to-metallicblack material resembling PbO2. X-ray Pb02, an ohmic resistivity of 0.82 ohm-cm, and an Chemical analysis showed a stoichiometry of PbO1.91. Crystal morphologies were examined in the electron microscope. Studies on the mechanism enter the PbO-L lattice as atoms, take two electrons from the Pb present in the lattice and Pb02 but had retained the diffraction pattern of open circuit potential in 1.225 sp gr H2504, 52 material had many of the chemical properties of types, both with the same space group as PbO-L, then diffuse through the lattice as ions. Two nv above that of beta-Pb02 in the same acid. of Pb0-L oxidation indicate that oxygen may P4/nmm. It is not possible at this time to the original tetragonal PbO. The oxidized Tetragonal Pb0 (designated Pb0-L) was

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

- 664 777 10/3 GULTON INDUSTRIES INC METUCHEN N J ALKALINE BATTERY AD- 664 777

DESIGN, FABRICATION AND TESTING OF VENTED RECHARGEABLE SILVER-CADMIUM CELLS.

3

DESCRIPTIVE NOTE: Final rept. May 66-Aug 67, Charlip, S. ; DEC 37 47P Charlip, CONTRACT: DA-36-039-AMC-03359(E) PROJ: DA-1-C-622001-A-053 TASK: 1-C-622001-A-05302 03359-F MONITOR:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, DESIGN), STORAGE
BATTERIES, ELECTRODES, SILVER, CADMIUM, CONSTRUCTION,
TESTS, PERFORMANCE(ENGINEERING), ELECTRICAL PROPERTIES,
BATTERY SEPARATORS IDENTIFIERS: BATTERY DISCHARGE, SILVER-CADMIUM DESCRIPTORS:

 $\tilde{\epsilon}$ silver-cadmium cells constructed from pasted positive were constructed with the following rated capacities The objectives of this program were to design, build, and test vented silver-cadmium cells, in four temperature storage, cold temperature, and data on cycle life. Inc test results indicate that the at the five-hour rate: Type 2 - 7 ampere-hours; and pressed negative electrodes should meet the Sizes with a common base area. Four cell types gives the capacities obtained from engineering evaluation tests for capacity, room and high Type 3 - 15 ampere-hours: Type 4 - 22 ampere hours; Type 5 - 31 ampere hours. The report functional test requirements.

UNCLASSIFIED

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ZOM07 SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

BATTERIES WITH ORGANIC OR MAGNESIUM PERCHLORATE ELECTROLYTE. COMPARATIVE HIGH RATE PENFORMANCE OF RESERVE

DESCRIPTIVE NOTE: Research and development technical Wilburn, Nicholas T. ; 76P 67

Almerini, Achille L.; Bradley, Charles J.; REPT. NO. ECOM-2880 PROJ: DA-11622001A053

1T622001A05302

# UNCLASSIFIED REPORT

PERFORMANCE(ENGINEERING)), (\*ELECTROLYTES, ORGANIC MATERIALS), ELECTRODES, LITHIUM, COPPER COMPOUNDS, HALIDES, ELECTRICAL PROPERTIES, MAGNESIUM, MAGNESIUM COMPOUNDS, DIOXIDES, STORAGE, RADIO EQUIPMENT, PORTABLE EQUIPMENT, POWER SUFPLIES
BATTERIES, RESERVE (U) (\*PRIMARY BATTERIES, DESCRIPTORS:

fairly well-established magnesium-manganese dioxide conditions to establish general feasibility for the AN/PRC-62 application. Moderately high rate organic electrolyte batteries to evaluate their performance in comparison to the temperature power source for modern communications were recently developed. A program was conducted electrolyte which, as a reserve type battery, is being investigated for use as a lightweight, all equipment, notably the AN/PRC-62. Batteries of system with an aqueous magnesium perchlorate both systems were evaluated under a range of

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ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

NAVAL RESEARCH LAB WASHINGTON D C

3 INCREASING THE DISCHARGE CAPACITY OF A SILVER OXIDE ELECTRODE BY CHARGING WITH 60-CYCLE ASYMMETRIC AC.

NOV 67 21P Wales, C. P.; REPT. NO. NRL-6619 PROJ: SF-013-06-06-4366, RR-001-43-4755

### UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*ALKALINE BATTERIES, ELECTRODES), (\*ELECTRODES, \*SILVER COMPOUNDS), STORAGE BATTERIES, OXIDES, ELECTRIC DISCHARGES, SILVER, ZINC, ELECTROLYTES, POTASSIUM COMPOUNDS, HYOROXIDES, BATTERY CHARGERS, ALTERNATING CURRENT IDENTIFIERS: SILVER ZINC BATTERY CELLS

when the KOH concentration was increased. No significant improvement occurred when the charge with unequal in amplitude, as compared with charging by a constant current, both being at the 20-hr rate in 35% KOH at 25C. Capacity depended on the proportion of charge and discharge components of the ac. Capacity improvements were smaller when net charge current was set at the 6-hr rate, when charge current was composed of 60-cps half-wave reverse electrodes used in storage batteries was improved 40 to 50% when the prior charge was made by an alternating, rather than constant, current. current superimposed on constant charge current, or This improvement was obtained by charging the cells with 60-cps asymmetric ac, composed of two opposing reverse current followed a series of discharges at conditions, gave capacity increases of 15 to 25% half-wave currents 180 degrees out of phase and The discharge capacity of sintered silver Commercial Ag-Zn cells, under the same the 1-hr rate. (Author)

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PAGE

UNCLASSIFIED

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SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

N- 663 002 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N AD- 663 002

MAGNESIUM BATTERY PROGRAM,

36 Donald B. :

Murphy, John J. ; Wood,

# UNCLASSIFIED REPORT

Proceedings Power Sources Conference 16-8 May Availability: Published in (21st) Annual

DESCRIPTORS: (\*PRIMARY BATTERIES, MAGNESIUM), (\*DRY BATTERIES, \*MAGNESIUM), BATTERY COMPONENTS, ELECTRIC BATTERIES, PRODUCTION, ELECTROLYTES, MAGNESIUM COMPOUNDS, ELECTRODES, MANGANESE COMPOUNDS, DIOXIDES, ANDES(ELECTROLYTIC CELL), NITROBENZENES, MILITARY SUPPLEMENTARY NOTE: Report on session on Primary REQUIREMENTS

IDENTIFIERS: MAGNESIUM WAFFER CELLS. ORGANIC

3

 $\Xi$ 

3 A review is given of programs being persued by USAECOM which are aimed at converting the magnesium dry battery system for military use. Topics include: Production contracts; Improvement of cylindrical cell structure; Development of magnesium. Flat cells; Development of reversed Mg anode atructure; Development of organic depolarized magnesium cells; Magnesium anode study.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 662 980

MAGNESIUM PERCHLORATE RESERVE BATTERY,

3

3

### Wilburn, Nicholas T. UNCLASSIFIED REPORT

44

Availability: Published in Annual Proceedings Power Sources Conference (21st) 4p 16-18 May

DESCRIPTORS: (\*PRIMARY BATTERIES, DESIGN), (\*LOW TEMPERATURE BATTERIES, DESIGN), MAGNESIUM COMPOUNDS, PERCHLORATES, NITROBENZENES, MATERIAL FORMING, PERFORMANCE(ENGINEERING), REVIEWS IDENTIFIERS: MAGNESIUM PERCHLORATE, RESERVE SUPPLEMENTARY NOTE: Report on Session on Primary Batteries.

3 3

> A review is given of the developmental status of high energy density, low temperature magnesium perchlorate batteries.

3

AD- 662 980

275

UNCLASSIFIED

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DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZCMO7

D- 662 960 21/3 10/3 10/2 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

BATTERY-FUEL CELL SYSTEM,

3

# 6P Frysinger, Galen R.

# UNCLASSIFIED REPORT

Availability: Published in Annual Proceedings
Power Sources Conference May 16-18 1967.
SUPPLEMENTARY NOTE: Rept. on Session on Vehicle
Propulsion Batteries.
DESCRIPTORS: (\*ELECTRIC PROPULSION, POWER SUPPLIES),
(\*\*BATTERY COMPONENTS, ELECTRIC PROPULSION), (\*FUEL
CELLS, ELECTRIC PROPULSION), CARGO VEHICLES, PROPULSION
SYSTEMS, POWER, EFFICIENCY, COSTS,
PERFORMANCE(ENGINEERING), FUELS, DESIGN, (U) DESIGN (U)

Through the use of a fuel cell-battery hybrid power source all of the 'battery problems' can be overcome. This power source allows an electric vehicle to have: (1) full range capability, (2) excellent acceleration characteristics, and (3) use of conventional hydrocarbon fuels. To achieve the required performance depends upon the successful development of a 150 watt hour per pound molten electrolyte battery and a 20-35 pound per kilowatt hydrocarbon-air fuel cell. Research progress indicates that these goals should be achieved in operational hardware within the next five to tenyears. An essentially similar version of this paper is available for public sale as AD-662 234, (U)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMD7

AD- 662 737 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J ELECTRONIC COMPONENTS LAB EVALUATION OF FOREIGN S-12 SILVER-ZINC CELLS. (U)

DESCRIPTIVE NOTE: Technical rept.,
OCT 67 28P Wagner, Otto C.
REPT. NO. ECOM-2884
PROJ: DA-116-22001-A-053

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, ALKALINE BATTERIES), SILVER, ZINC, ELECTRODES, BATTERY SEPARATORS, PERFORMANCE(ENGINEERING), BATTERY COMPONENTS, ELECTRIC BATTERIES

Two foreign S-12 silver-zinc cells used to power a transceiver were evaluated. Low temperature performance was significantly poorer than that of comparable US cells, while room temperature performance was significantly poorer than that of performance was equivalent. Dissection of one S-12 cell showed that it was designed with an excess of silver powder and that it contained a separator wrap which will limit the useful life of the cell to three to four months, particularly for applications in the tropics. Another shortcoming of the S-12 cells is that the zinc negatives are wrapped in cellophane membrane, a design feature which will decrease the zinc capacity at high rates and/or low temperatures. To maintain maximum capacity under extreme environmental conditions it is standard practice in the US to wrap the silver positives in cellophane membrane. (Author)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

- 662 234 21/3 10/2 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J ELECTRONIC COMPONENTS LAB

BATTERY-FUEL CELL SYSTEM,

3

Frysinger, Galen R. : 22P MAY 67

# UNCLASSIFIED REPORT

3 Supplementary NOTE: Prepared for presentation at the Annual Power Sources Conference (21st)
Atlantic City, N. J., May 67.
BECRIPTORS: (\*ELECTRIC PROPULSION, POWER SUPPLIES), (\*BATTERY COMPONENTS, ELECTRIC PROPULSION), (\*FUEL CELLS, ELECTRIC PROPULSION), CARGO VEHICLES, ELECTRIC MOTORS, POWER, WEIGHT, EFFICIENCY, FUELS, (U)FUELS

3 problems! can be overcome. This power source allows an electric vehicle to have: (1) full range capability, (2) excellent acceleration characteristics, and (3) use of conventional Evdrocarbon fuels. To achieve the required performance depends upon the successful development Through the use of a fuel cell-battery hybrid power source for vehicular propulsion all of the 'battery battery and a 20-35 pound per kilowatt hydrocarbonof a 150 watt hour per pound molten electrolyte air fuel cell. Research progress indicates that these goals should be achieved in operational hardware within the next five to ten years.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMOT DDC REPORT BIBLIOGRAPHY

- 661 215 10/3 UNIV SILVER SPRING MD APPLIED PHYSICS

CHARACTERISTICS OF HERMETICALLY SEALED NICKEL CADMIUM BATTERIES.

Wilson, L. : DESCRIPTIVE NOTE: Technical memo., AUG 67 46P Wilson,L.

NOW-62-0604 TG-942 REPT. NO. CONTRACT:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*SPACECRAFT COMPONENTS, STORAGE
BATTERIES), (\*STORAGE BATTERIES, REVIEWS), (\*ALKALINE
BATTERIES, REVIEWS), THERMODYNAMICS, ELECTROCHEMISTRY,
ELECTRICAL PROPERTIES, THERMAL PROPERTIES,
SATELLITES(ARTIFICIAL), POWER SUPPLIES, NICKEL, CADMI

this area. Recommendations and guide lines are included for use in the design of a battery geared to (i.e., capacity, voltage, and current) on temperature and loads is reviewed from a user's point of view and generally reflects APL's experience in electrochemistry, and internal energy losses of satellite nickel cadmium batteries presently in by APL. Dependence of electrical parameters operate for over two years in orbit. (Author) The report summarizes basic thermodynamics,

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

3 EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT MAGNESIUM/MAGNESIUM-PERCHLORATE MANGANESE DIOXIDE BATTERIES FOR FIELD RADIO APPLICATIONS.

DESCRIPTIVE NOTE: Technical rept. no. 1, Oct 66-Aug Cupp, E. B. ; Broglio, E. NOV 67 34P

CONTRACT: DAABO7-67-C-0116 PROJ: DA-116-22001-A-053 TASK: 02

0116-1 ECOM

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, DESIGN), (\*PRIMARY BATTERIES, DESIGN), ELECTROLYTES, CALCIUM COMPOUNDS, MAGNESIUM COMPOUNDS, PERCHLORATES, ELECTRODES, MAGNESIUM, MANGANESE COMPOUNDS, DIOXIDES, HAZARDS, ELECTRICAL PROPERTIES, STORAGE, RADIO EQUIPMENT, POWER SUPPLIES, (U)POWER SUPPLIES DESCRIPTORS:

accomplishments made toward meeting the design goals for the type 62 battery. The design effort directed toward lighter battery weight, nonspill features, activated storage and control of battery expansion are described in detail. The report concludes with a final 6.5 pound battery design which should meet the requirements for the type 62 battery. The report describes the significant (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MO7

COAST GUARD WASHINGTON D C TESTING AND DEVELOPMENT 13/10

AIR TESTS WITH 'B' BATTERIES,

3

Lomer, L. R. 130 REPT. NO. 468 TASK: 3964/04/02

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*BUOYS, STORAGE BATTERIES), (\*STORAGE BATTERIES, TEST METHODS), VALVES, ELECTROLYTES, PRESSURE

3

3 Docket air tests and to determine what air pressures and procedures could be used to prevent physical and/ has been reported in connection with buoy pocket air tests. Reported herein are the results of completely successful test configuration of battery and spill valve required the battery to be in the vertical position before the 5 psi battery pocket Pressure was released with the battery inclined and vertical and tests were conducted to determine air flow characteristics through the carbons. The only or electrical damage to the BY type batteries.
The double electrolyte spill valves were tested separately as well as with the batteries for operating characteristic at different pressures. different tests designed to simulate the battery The BY butteries were tested in an air tank in inclined (20 deg. from horizontal) and vertical positions. Air pocket tests were simulated with Damage to Edison type BY carbonaire batteries hot and cold electrolyte. Battery pocket air test air pressure was released. (Author)

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AD- 660 168

AD- 661 069

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PAGE

BATTERY CORP OF AMERICA FORT LAUDERDALE FLA AD- 659 790

NEW MAGNESIUM ANDDE STRUCTURE.

3

DESCRIPTIVE NOTE: Final rept. 1 Mar 66-28 Feb 67, Balaguer, Rodolfo R.; 85P REPT. NO

DA-28-043-AMC-01998(E) DA-1C6-22001-A053 1C6-22001-A053-02-24 CONTRACT PROJ: TASK:

01998-F MONITOR: ECOM

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Continuation of Contracts DA-36-039-AMC-03369(E).
DESCRIPTORS: (\*DRY BATTERIES, OPTIMIZATION), (\*PRIMARY BATTERIES, OPTIMIZATION), (\*PRIMARY BATTERIES, OPTIMIZATION), (\*ANDDES(ELECTROLYTIC CELL), \*MAGNESIUM), MATERIALS, BINDERS, CONTAINERS, ELECTRIC, INSULATION, ELECTROLYTES, MAGNESIUM COMPOUNDS, STRONTIUM COMPOUNDS, BROMIDES, ELECTRICAL PROPERTIES, (U) IDENTIFIERS: MAGNESIUM BROMIDE, STRONTIUM BROMIDE (U)

utilizes a thermosetting resin binder instead of the coal tar pitch formerly used. Thirteen allow cells to dry out. Nine experimental lots having electrolytes of mixed magnesium and strontium different materials of construction, except that polyviny! tape was found to deteriorate at 160F and experimental lots were made and put on test to evaluate various materials for the cell jacket, the same construction as that developed on previous contracts except for an improved carbon cup which controls, were made to investigate the effects of mixed bromide electrolytes on low temperature performance and delay time. Capacity maintenance at 130F was over 90 per cent at up to five months. The basic 'D' ce. I made on this contract has the bromides in three molecular ratios and in three performance were observed between cells using reinforcing tape. No definite differences in normalities, together with magnesium bromide anode sealing washer and the insulating and Uniformity was good.

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY AD- 659 465

DOUGLAS AIRCRAFT CO INC NEWPORT BEACH CALIF ASTROPOWER

3 SEPARATORS FOR HIGH-RATE, NON-RESERVE ZINC-SILVER OXIDE BATTERIES.

Semiannual rept. no. 1, 20 Feb-Jul DESCRIPTIVE NOTE:

Himy, A. ; Strier, M. P. ; DAC-59852-51 REPT. NO. SEP

CONTRACT: DAAB07-67-C-0310 DA-1C622001A053 PROJ:

# UNCLASSIFIED REPORT

0310-1

MONITOR: ECOM

1C622001A05302

TASK:

33 (\*ALKALINE BATTERIES, BATTERY SEPARATORS), (\*BATTERY SEPARATORS, ACCEPTABILITY), INORGANIC COMPOUNDS, BINDERS, POLYMERS, MATERIAL FORMING, ELECTRICAL RESISTANCE, DIFFUSION, OXIDATION, PERMEABILITY, ZINC, SILVER COMPOUNDS, OXIDES IDENTIFIERS: ZINC-SILVER OXIDE CELLS DESCRIPTORS:

rate, nonreserve zinc-silver oxide batteries capable of operation at temperatures as high as 165F. in the liquid formulation, resulting in a dip-coated electrode. The results favored the binder P as on glass or Teflon; a slurry was introduced in a porous thin matrix; the silver electrode was dipped Dinder. Two basic materials designated 3355-25 and 3420-09 were selected to make separators and were Separator materials were evaluated for use in high characteristics, the material 3420-09 was selected 77F and at 165F, silver and zinc diffusion rates, resistance to oxidation by silver saturated KOH solution. Although both materials showed close blending, two types of organic binders, K and P, and three procedures were used: the film was cast The films were obtained by blending an inorganic material (previously used to make separators for evaluated for resistivity, inertness in KOH at for it's greater stability in KOH at 165F. For secondary silver-zinc cells) with an organic

3

more stable.

PAGE

3

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

ESB INC RESEARCH CENTER YARDLEY PA AD- 659 419

HIGH ENERGY SYSTEM (ORGANIC ELECTROLYTE).

3

Final rept., 15 Jun 66-14 Jun 67, Boden, D. P. ; Bunner, H. DA-28-043-AMC-02304(E) DA-110-14501-A-34A TD-14501-A-34A-00 02304-F SEP 67 131P R. ; Spera, V. J. . DESCRIPTIVE NOTE: ECOM CONTRACT: MONITOR:

# UNCLASSIFIED REPORT

(\*WET CELLS, ORGANIC MATERIALS), (\*ELECTROLYTES, ORGÁNIC MATERIALS), (\*CATHODES(ELECTROLYTIC CELL), MATERIALS), ORGANIC SOLVENTS, COMPATIBILITY, GLYCOLS, SULFITES, ALKENES, COPPER COMPOUNDS, FLUORIDES, LITHIUM COMPOUNDS, PERCHLORATES, GRAPHITE, PURIFICATION, MEMBRANES, ION 3 3 ORGANIC MATERIALS), DENTIFIERS: COPPER(II) FLUORIDE, LITHIUM PERCHLORATE, EXCHANGE, BATTERY SEPARATORS, ELECTROCHEMISTRY, ( \* BATTERY COMPONENTS. (U) ELECTROCHEMISTRY ORGANIC BATTERIES

3 preventing the transfer of soluble copper species and subsequent galvanic deposition of copper on the Li conventional microporous separators were incapable of The major goal of this work was to improve the activated storage life and discharge rate capability of the Li/CuF2 cell described in AD-639 704. storage of cells was improved, but at the expense of appeared to be propylene glycol sulfite and diethyl and ion exchange membrane evaluation revealed that high cathode polarization. A program of separator In addition, the scope was extended to include LiClO4/P. C. solution, was effected by purification of LiClO4 diethyl ether according to the method of Berglund and Sillen. A study of Li/CuF2 cells with cathodes containing purified graphite ther revealed that activated electrolytes. The most promising new solvents anode and resultant cell failure on activated sulfite. A reduction of more than an order of investigation of new cathode material and magnitude, in the solubility of CuF2 in

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

NAVAL RESEARCH LAB WASHINGTON D C 10/3 AD- 658 747

3 REFRACTOMETRIC SENSING OF H2SO4 SPECIFIC GRAVITY IN LEAD-ACID CELL OPERATION,

REPT. NO. NRL-6562 PROJ: SF-013-06-06-4366, RR-001-01-43-4755 Burbank, Jeanne; 16P JUL 67

# UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*STORAGE BATTERIES, TEST METHODS), (\*REFRACTOMETERS, OPERATION), SULFURIC ACID, DENSITY, REFRACTIVE INDEX, ELECTROLYTES, DETECTORS IDENTIFIERS: LEAD ACID CELLS, SPECIFIC GRAVITY

lead-acid cell. It introduces no contamination, is index of fluids was used to record the changes in durable, and minimizes test sampling and personal continuous automatic monitoring of the refractive electrolyte specific gravity during cycling of a control systems and can be operated as a level A simple inexpensive dipping refractometer for attendance. It may be adapted for automatic indicator. (Author)

3

AD- 658 747

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AD- 659 419

UNCLASSIFIED

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DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

- 658 111 10/3 5/2 NAVAL ORDNANCE LAB CORONA CALIF

3 CHEMOELECTRIC ENERGY CONVERSION FOR NONAQUEDUS RESERVE BATTERIES.

DESCRIPTIVE NOTE: Quarterly rept. no. 14, Oct-Dec 66, AUG 67 24P Bennion, Douglas N.; Schaer, Bennion, Douglas N.; Schaer, Michael J. :Spindler, W. C. ; REPT. NO. NOLC-737

TASK: ORD-033-321/215-1/F009-06-04, A34-340-001/211-1/ MONITOR: IDEP 102.80.00.00-X7-01 R010-01-01

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-648 706.
DESCRIPTORS: (\*GUIDED MISSILE BATTERIES,
ELECTROCHEMISTRY), (\*ELECTROLYTES, \*ORGANIC NITROGEN
COMPOUNDS), (\*ENERGY CONVERSION, \*INFORMATION
RETRIEVAL), (\*BATTERY COMPONENTS, \*ELECTROCHEMISTRY),
NITROBENZENES, FUEL CEL.5, ELECTRICAL CONDUCTIVITY,
O'SANIC SOLVENTS, SULFOXIDES, OXIDATION REDUCTION
REACTIONS, INFRARED SPECTRA, AMINES, DATA PROCESSING,
SUBJECT INDEXING, (U)SUBJECT INDEXING
IDENTIFIERS: AMMONIA-ACTIVATED BATTERIES, DINITRO
BENZENES, KWIC INDEX, ORGANIC BATTERIES, SULFOXIDE/ 3 3 DIMETHYL

reached a maximum as temperature was increased from electroreduction products of organic nitro-compounds conductivity was completed, and testing of m-DNB in liquid ammonia was begun. Solution conductance in acid ammonia solutions. Nitrobenzene undergoes conductivity found to be about 0.001/ohm/cm in a solution saturated with LiCl or LiND3. Investigation of transport parameters of organic Attempts were made to identify by IR spectra the hydroxylamine, as identified by its IR spectrum. Mowever, di-substituted nitrobenzene compounds could not be ide tified by IR spectra, probably 60 to -20C. In addition, the solubility of m-DNB in dimethylsulfoxide was determined, and a complete four-electron reduction to phenyl nitro-compounds in solution in nonaqueous because of side reactions.

## UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

1- 656 619 10/3 MASSACHUSETTS INST OF TECH CAMBRIDGE CENTER FOR MATERIALS SCIENCE AND ENGINEERING AD- 656 619

INVESTIGATION OF A PIN-STRUCTURE GERMANIUM PHOTOVOLTAIC CELL.

3

DESCRIPTIVE NOTE: Semi-annual rept. 15 Jul 66-1 Feb

Wedlock, B. D. ; Siegel, R. ; Hewes, C. R. ; Smythe, D. L. ; NOS

DA-28-043-AMC-01978(E) DA-1C0-14501-A-34-A CONTRACT: PROJ:

MONITOR: ECOM 01978-2

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*GERMANIUM, \*RADIOISOTOPE BATTERIES), DIODES, ELECTRICAL RESISTANCE, EFFICIENCY, INTENSITY, TEMPERATURE, GEOMETRY, THEORY, CONDUCTIVITY, ELECTRON DENSITY, SOURCES, DESIGN, EMISSIVITY, BLACKBODY RADIATION

3 an assumed lifetime law. A study of the mobility in the high injection intrinsic region was made, and an empirical formula for the variation with injection level established. It is shown that this formula explained in terms of the distributed resistance and Several phenomena affecting the V-I characteristics of PIN thermophotovoltaic converter diodes a e discussed, including diffused layer recombination, minority carrier injection, and non-planar effects. Analysis of the distributed resistance is developed to estimate the optimum converter dimensions. Experimental results on several diodes are presented, and their behavior lies between two proposed theories for mobility variation. (Author)

PAGE

AD- 658 111

ZOMOZ DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

HARRY DIAMOND LABS WASHINGTON D C 10/3

THE THERMAL REACTION BATTERY ELECTROLYTES FROM THE PYROLYSIS OF OXIME DERIVATIVES,

Dewey, Fred M. ; DA-IN523801A300, HDL-96300 HDL-TR-1351 29P

## UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*THERMAL BATTERIES, ELECTROLYTES), (\*ELECTROLYTES, OXIMES), (\*ELECTROLYTES, OXIMES), (\*OXIMES, PYROLYSIS), ORGANIC SOLVENTS, ESTERS, ETHERS, DECOMPOSITION, REACTION KINETICS, ELECTRICAL CONDUCTIVITY, CATALYSIS, SYNTHESIS(CHEMISTRY) DESCRIPTORS:

DENTIFIERS: ALDOXIMES

3 yield permanently liquid solvents for ionizable salts that an acceptable pyrolysis rate can be obtained at proposed thermal reaction battery. Several oximes, oxime esters, and oxime ethers were prepared and pyrolyzed. Some of the pyrolyses were rapid at temperatures near 200C, most success being attained with aldoxime esters. Evidence thus far indicates have indicated that solutions of inorganic salts in Organic compounds that can be thermally degraded to boiling materials. Prior conductivity measurements specific conductances sufficient for the proposed are being sought for use in electrolytes for the the pyrolysis products of oxime esters will give catalysts or at higher temperatures using highthese or lower temperatures using Lewis-acid thermal reaction battery. (Author)

## UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

TRW SYSTEMS REDONDO BEACH CALIF

VOLTAMMETRIC STUDIES OF NON-AQUEOUS SYSTEMS.

3

DESCRIPTIVE NOTE: Semi-annual rept. no. 1, 1 Jul-31 Dec 66,

Paez, 0. ; Seo, E. T. 99P Silverman, H. P. ; APR 67

CONTRACT: DA-28-043-AMC-02464(E) PROJ: DA-1C014501A34A TASK: 1C014501A34A00

# UNCLASSIFIED REPORT

02464-1

ECOM

DESCRIPTORS: (\*BATTERY COMPONENTS, ORGANIC MATERIALS), (\*ELECTROLYTES, ORGANIC MATERIALS), (\*CATHODES(ELECTROLYTIC CELL), ORGANIC MATERIALS), (\*CATHODES(ELECTROLYTIC CELL), ORGANIC MATERIALS), (\*ORGANIC NITROGEN COMPOUNDS, ELECTROCHEMISTRY), ORGANIC SOLVENTS, REDUCTION(CHEMISTRY), NITROBENZENES, CARBONATES, NATODES(ELECTROLYTIC CELL), LITHIUM, OXIDIZERS, NITROPHENOLS, TOLUENES, CHLORINE COMPOUNDS, ALCOHOLS, ALKANES, (U)ALKANES, ORGANIC BATTERIES (L)

3 Voltammetric studies of the reduction of organic compounds in organic solvents were undertaken as part of a program to develop high-energy density organic electrolyte batteries. Cyclic voltammetry was used as a major diagnostic tool for evaluating organic oxidizing agents as possible high-energy density interpretation are presented for a number of selected cathode materials, and to elucidate the mechanisms of a heterogeneous electron transfer and any homogeneous included m- and p-dinitrobenzene, 2,5-dinitrophenol, the study of various nitroanomatic compounds, cyclic nitroaromatic compounds. The effects of methyl-, halo-, and hydroxy-groups on the electroreduction process were demonstrated. Compounds studied m-dinitrotoluene, 1-chloro-2,6-dinitrobenzene and nitroalkanes. The addition of lithium ions was shown to have a beneficial effect on organic voltammetric current-potential curves and their follow-up chemical reactions. The report covers reductions under selected conditions. (Author)

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#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

- 655 021 10/3 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO AD- 655 021

3 POLYTECHNIC INSTITUTE, NOVOCHERKASSK. TRANSACTIONS, VOL. 134, 1964. SELECTED ARTICLES.

MEPT. NO. FTD-MT-65-485 MONITOR: TT 67-62280 41P

# UNCLASSIFIED REPORT

Politekhnicheskii Institut, Novocherkassk. Trudy (USSR) v134 p3-30 1962.

DESCRIPTORS: (\*STORAGE BATTERIES, ELECTRICAL PROPERTIES), (\*ALKALINE BATTERIES, ULRASONIC PROPERTIES), ELECTRODES, ZINC, SILVER, ELECTROLYTES, THERMAL BATTERIES, ELECTROCHEMISTRY, NICKEL, NICKEL COMPOUNDS, OXIDES, HYDRIDES, ANODES(ELECTROLYTIC CELL), CHEMICAL PRECIPITATION, USSR (U) IDENTIFIERS: SILVER ZINC BATTERY CELLS (U) SUPPLEMENTARY NOTE: Edited machine trans. of

3 Contents: Active mass of zinc-silver storage battery; Influence of ultrasonics on certain properties of nickel electrode of alkaline storage

## UNCLASSIFIED

SEARCH CONTROL NO. ZOMO? DDC REPORT BIBLIDGRAPHY

BURGESS BATTERY CO FREEPORT ILL AD- 655 000

P DEVELOPMENT OF CARBON-ZINC BATTERIES CAPABLE STORAGE UP TO 160F.

3

DESCRIPTIVE NOTE: Rept. no. 2, 1 Jul 66-31 Mar 67

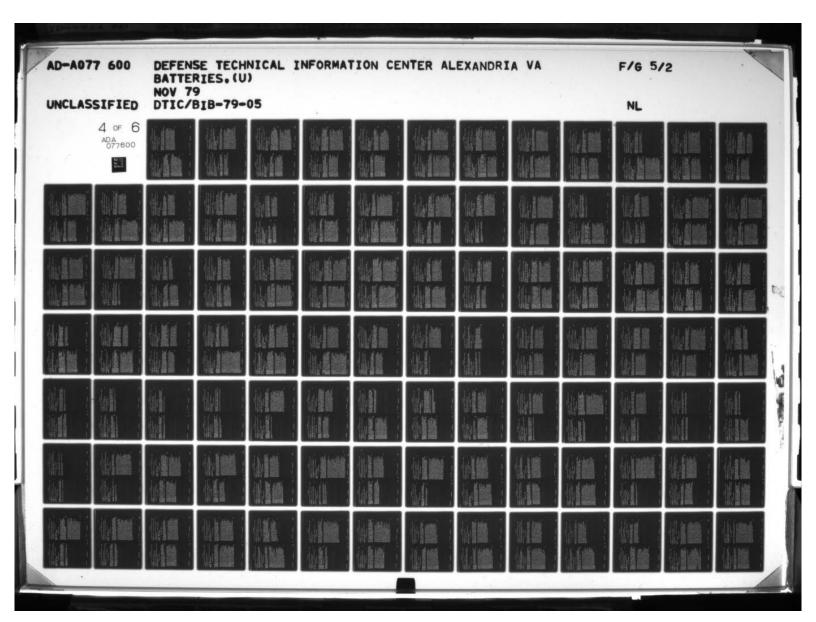
(Final),

02391-F MONITOR: ECOM

# UNCLASSIFIED REPORT

33 SUPPLEMENTARY NOTE: See also AD-652 720.
DESCRIPTORS: (\*PRIMARY BATTERIES. STORAGE), (\*BATTERY COMPONENTS, THERMAL STABILITY), ELECTROLYTES. AMMONIUM COMPOUNDS, ZINC COMPOUNDS, CHLORIDES, ELECTRODES, CARBON, ZINC, THERMAL PROPERTIES, CONFIGURATION, CORROSION INHIBITION, (U)CORROSION INHIBITION ZINC CELLS

3 the present product is submitted. An analysis of the merits of geometric considerations is given, and data presented to show the capabilities of various cell constructions. (Author) battery capable of prolonged storage at high temperatures is given. A summary of the ability of Discussion of the development of a carbon zinc



ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

ORGANIC ELECTROLYTE HIGH ENERGY DENSITY BATTERIES.

Braeuer, Klaus H. M. DESCRIPTIVE NOTE: Status rept.,

MAY 67 57P Harvey, Jay A.; REPT. NO. ECOM-2844

PROJ: DA-1C014501A34A

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*ELECTROLYTES, ORGANIC MATERIALS),
(\*BATTERY COMPONENTS, STATE-OF-THE-ART REVIEWS),
SOLVENTS, COMPATIBILITY, ANODES(ELECTROLYTIC CELL),
CATHODES(ELECTROLYTIC CELL), ELECTROLYTIC CELL),
TRANSFER, LITHIUM, COPPER COMPOUNDS, SILVER COMPOUNDS,
HALIDES, OXIDES, AIR, BATTERY SEPARATORS, ELECTROLYTIC
CELLS, STORAGE, PERFORMANCE(ENGINEERING),
(U)PERFORMANCE(ENGINEERING),
(U)PERFORMANCE(ENGINEERING),
(U)DENTIFIERS: ORGANIC BATTERIES

reviewed to present the data which has been published in a more convenient, condensed form, and to pinpoint the problem areas on which future work should be organic electrolyte batteries has been summarized and concentrated. The report encompasses work which was published during the period 1962 to October 1966, and which was sponsored either by the US Government or by industrial companies and made available to the public. The material in this report is organized as follows: (1) selection of anode-cathode couples, (2) selection of The state of the art of high energy density,

battery components including electrolytes, half-cell systems, and separators, (3) design and performance of experimental cells, and (4) problem areas and areas of future work. (Author)

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## UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

ACCUMULATOR BASED ON ROD ELEMENTS

3

Turov, R. A. ; REPT. NO. FTD-HT-66-793 **6**P

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# UNCLASSIFIED REPORT

Elementakh, unedited rough draft trans. of Patent (USSR) 178 173, appl. 918545/26-9, 28 Aug 64. DESCRIPTORS: (\*STORAGE BATTERIES, RODS), PATENTS, USSR, FILMS, COATINGS, FERROMAGNETIC MATERIALS, WINDING SUPPLEMENTARY NOTE: Nakopitel na Sterzhnevykh

3 The article describes an accumulator based on rod elements with a thin-film ferromagnetic coating and windings which embrace a series of parallel-mounted rod elements which for the purpose of simplifying the technology of construction of accumulator and improving the precision of placing the rod elements relative to the windings, the windings of the accumulator are designed in the form of perpendicular conductors arranged in a longitudinal slot of the modular plate, and the rod elements are set in chemical: which remain after removing the pegs by which there was accomplished the placing of the winding and their fastening during application of compound. (Author)

AD- 654 813

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

MARATHON BATTERY CO WAUSAU WIS AD- 654 471

DEVELOPMENT OF IMPROVED ZINC BATTERIES FOR HIGH TEMPERATURE STORAGE.

3

DESCRIPTIVE NOTE: Semi-Annual rept. no. 1, 30 Sep 66-1 Schroeder, George H. ; Jun 67.

JUN 67 46P Schroede CONTRACT: DA-28-043-AMC-02534(E)

DA-1C6-22001-A053 PROJ: TASK:

02534-1 MONITOR: ECOM

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*PRIMARY BATTERIES, HIGH TEMPERATURE), (\*BATTERY COMPONENTS, STORAGE), COSTS, ZINC, CARBON, MANGANESE, DIOXIDES, PERFORMANCE(ENGINEERING), TABLES(DATA), (U)TABLES(DATA)

3 elevated temperatures as well as to the efforts made The report describes results obtained in an effort to improve the high temperature storageability of cylindrical zinc-MnO2 Le Clanche cells. Reference is made to the causes of break down at to eliminate them.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

SONOTONE CORP ELMSFORD N Y 10/3 AD- 654 130

STANDARD LINE-BATTERY ASSEMBLY BB-610()/U NICKEL CADMIUM VENTED

3

DESCRIPTIVE NOTE: Final rept., 29 Apr 66-17 Jan 67
JUN 67 151P Nathe,R.; Herrmann,J.;
CONTRACT: JA-28-043-AMC-01508(E)
PROJ: DA-1C622001A053
TASK: 1C622001A05302

01508-F MONITOR: ECOM

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-637 156, DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), GLASS TEXTILES, CONTAINERS, NICKEL, CADMIUM, ENVIRONMENTAL TESTS, MECHANICAL DRAWINGS, DATA

3

recommendations are given concerning the program and ideas are submitted for consideration on any similar certain environmental tests, Sonotone has supplied their certified test data sheets. For the results of acceleration, bounce, and vibration, United Aerotest Inc. has supplied their own test data. Included in the report are the battery's official parts list, listed in order of parts breakdown, and accompanied by page-size assembly drawings of all battery parts. Overall conclusions and development activities which have been directed toward the design of a 12-volt, 14 A.H., Nickel-Cadmium, vented battery housed in a fiberglas case. This report attests that the contracted battery has met all the requirements of the applicable specifications. For the results of The report covers the concluding research and

3

future programs. (Author)

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

3 ADVANCED DEVELOPMENT MODELS OF SEALED NICKEL-CADMIUM EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT BATTERIES.

DESCRIPTIVE NOTE: Test rept., Carr, E. S. ; LaFollette DA-28-043-AMC-00070(E) DA-1C6-22001-A-053 TASK: 1C6-22001-A-053-02 00000-T MONITOR: ECOM CONTRACT: PROJ:

# UNCLASSIFIED REPORT

33 PERFORMANCE(ENGINEERING)), (\*BATTERY COMPONENTS, PERFORMANCE(ENGINEERING)), ACCEPTABILITY, NICKEL, CADMIUM, ELECTRIC DISCHARGES, ELECTRICAL PROPERTIES, ( \* ALKALINE BATTERIES, VIBRATION, STORAGE, (U)STORAGE IDENTIFIERS: NICKEL-CADMIUM CELLS

3 satisfactory based on performance during these tests. Cycle tests were performed as per Paragraph 4.11 demonstrated the required discharge capacity after 1008 cycles of 61.5% depth. (Author) U. BB-469/U. BB-470/U. BB-471/U and BB-472/U were subjected to the acceptance tests of Paragraph 4.3.1 of Specification SCL-6868B dated 12 Febrary 1964. Each battery type passed acceptance criteria. The design is deemed of SCL-6868B. The tested batteries of all types Sixteen batteries each of BB-467/U, BB-468/

## UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

ELECTRIC STORAGE BATTERY CO YARDLEY PA CARL F NORBERG RESEARCH CENTER

3 HIGH ENERGY SYSTEM (ORGANIC ELECTROLYTE)

DESCRIPTIVE NOTE: Quarterly rept., no. 3, 15 Dec 66-15 Buhner, H. R. ; Spera, V. 54P 67 Mar 67, NOT

DA-28-043-AMC-02304(E) MONITOR: ECOM 02304-3 PROJ: 1C0-14501-A-43A REPT. NO. 7 CONTRACT:

# UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*STORAGE BATTERIES, ELECTROLYTES),
(\*ELECTROLYTES, ORGANIC MATERIALS), (\*BATTERY
COMPONENTS, ORGANIC MATERIALS), LITHIUM, COPPER
COMPOUNDS, FLUORIDES, ORGANIC SOLVENTS, UREIDES, ORGANIC
SULFUR COMPOUNDS, GLYCOLS, CONCENTRATION(CHEMISTRY),
SOLUBILITY, LITHIUM COMPOUNDS, PERCHLORATES, GRAPHITE,
PURIFICATION, CATHODES(ELECTROLYTIC CELL), COMPLEX
COMPOUNDS, ETHYLENEDIAMINE, ELECTRIC DISCHARGES,
REACTION KINETICS, SULFITES, (U)SULFITES
(U) See also AD-648 920. SUPPLEMENTARY NOTE:

Progress is described of work undertaken to improve Observations that Centain impurities were adversely were investigated, and the organic sulfur compound was found to be promising. Methods for purifying graphite were investigated as a result of the Complexones were re-evaluated, and although it was affecting cathode performance on activated stand. found that ethylene diamine effected an improved Tetramethylurea and 1,2-propylene glycol sulfite electrolyte with properties superior to those of the activated storage life, and to increase the cells. A continuing search was made for new electrolyte solvents in order to obtain an current density capability of the Li/CuF2 activated stand for Li/CuF2 cells, the Licl04/propylene carbonate solutions. improvement was only marginal. 3

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AD- 653 785

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

GLOBE-UNION INC MILWAUKEE WIS APPLIED RESEARCH LABS 10/3

LITHIUM-MOIST AIR BATTERY.

3

DESCRIPTIVE NOTE: Interim rept., FEB 67 18P Foley, R. T. ; Taborek, E.

UNCLASSIFIED REPORT

REPT. NO. 2 CONTRACT: DA-44-009-AMC-1386(T)

HIGH ENERGY ELECTRCCHEMICAL COUPLES. II. GAS

AMERICAN UNIV WASHINGTON D C

AD- 653 779

ELECTRODES IN ORGANIC SOLVENTS.

3

DESCRIPTIVE NOTE: Semiannual rept. no. 2, MAR 67 41P Toni,Korge E. A.; Zwaagstra,R. L.;Elliott,William E.; CONTRACT: DA-44-009-AMC-1552(T)

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-642 248.

DESCRIPTORS: (\*STORAGE BATTERIES, \*LITHIUM), (\*BATTERY COMPONENTS, ELECTROCHEMISTRY), (\*ELECTRODES, AIR), (\*ORYGEN, REDCTION(CHEMISTRY)), PLATINUM, ELECTROLYTES, AMMONIUM COMPOUNDS, PHOSPHATES, NITROSO COMPOUNDS, AMINES, WATER, MOISTURE, REACTION KINETICS, OXIDATION REDUCTIONS, DISPROPORTIONATION, PEROXIDES, HYDROXIDES, INTERACTIONS, SURFACES, ELECTRIC PROPULSION, POWER SUPPLIES, (U) POWER SUPPLIES (I) DENTIFIERS: LITHIUM-AIR BATTERIES

mechanism of the oxygen reduction (air electrode) in nonaqueous media. The smooth platinum/02 saturates phenyltrimethyl ammonium hexafluorophosphate-nitrosodimethylamine system was studied extensively. The effect of water on the kinetics was also included. The overall process of oxygen reduction is a complex mechanism which The second step is very inneversible and possibly is the reduction of peroxide to hydroxide which can only occur when protons are available. Water (protons) plays an important role in all of the mechanism. Accumulation of oxygen on the electrode and interaction between 02 and Pt was also ECE mechanism consists of the reduction of oxygen Work was directed toward the understanding of the to peroxide with superoxide as an intermediate. disproportionation as a side complication. The reduction step includes an ECE mechanism with includes two main reduction steps. The first studied. (Author)

33 COMPONENTS, ELECTROCHEMISTRY), (\*OXYGEN, REDUCTION(CHEMISTRY)), GASES, ELECTROLYTES, ORGANIC SOLVENTS, PURIFICATION, DISTILLATION, ELECTROLYTIC CELLS, DESIGN, CONSTRUCTION, ELECTRIC PROPULSION, POWER SUPPLIES, (U)POWER SUPPLIES DESCRIPTORS: (\*STORAGE BATTERIES, \*LITHIUM), (\*BATTERY IDENTIFIERS: LITHIUM-AIR BATTERIES

3 propulsion. A literature survey was made on the cathodic oxygen electrode in non-aqueous solvents and revealed that, while very little work on this information on selected electrochemical couples which one-electron reduction of oxygen in several organic Electrochemical cells were designed and fabricated. may be useful in the development of electrochemical reaction has been done, there exists a reversible solvents. An attempt to purify the solvent by electrolysis was unsuccessful. A spinning band column was set up for fractional distillation. The purpose of the work is to provide basic (Author) 3

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 652 340 10/3 13/10
NAVY ELECTRONICS LAB SAN DIEGO CALIF

EVALUATION OF EXTERNAL BATTERY POWER SUPPLY FOR (U)

DESCRIPTIVE NOTE: Evaluation rept.,
AUG 61 21P Shumaker,L. A.
REPT. NO. NEL-1063

## UNCLASSIFIED REPORT

DESCRIPTORS: (\*UNDERWATER VEHICLES, POWER SUPPLIES), (\*STORAGE BATTERIES, PERFORMANCE(ENGINEERING)), OCEANOGRAPHIC SHIPS, COSTS, HIGH PRESSURE, HYDROSTATI(U) IDENTIFIERS: BATHYSCAPHS, TRIESTE (VESSEL) (U)

power supply on the bathyscaph TRIESTE. Methods
were developed for encapsulating batteries, relaying
power, insulating batteries, and transmitting water
pressure to prevent casings from collapsing. Leadacid storage batteries were found to provide an
effective and practical power source under pressures
they are cheaper than silver-zinc cells and may be
mounted externally to save cabin space. Report
recommends them on TRIESTE and recommends extending
investigations to include other types of 'wet'
batteries for similar uses. Charts and
performance, installation, and testing procedure.
(Author)

## UNCLASSIFIED

AD- 651 961 10/3
EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT

ADVANCED DEVELOPMENT MODELS OF VENTED NICKEL-CADMIUM BATTERIES. (U)

DESCRIPTIVE NOTE: Test rept., FEB 67 57P Lafollette, H. H. ; Carr, E. S. ;

REPT. NO. NA-121 CONTRACT: DA-28-043-AMC-00065(E) PROJ: DA-1C6-22001-A-533 TASK: 1C6-22001-A-053-02

# UNCLASSIFIED REPORT

00065-T

MONITOR:

DESCRIPTORS: (\*ALKALINE BATTERIES, ACCEPTABILITY), (\*BATTERY COMPONENTS, ACCEPTABILITY), SPECIFICATIONS, PERFORMANCE(ENGINEERING), ELECTRICAL PROPERTIES, ELECTRIC DISCHARGES, VIBRATION, THERMAL PROPERTIES, ACCELERATION, ELECTRICAL INSULATION, LEAKAGE(ELECTRICAL), (U)LEAKAGE(ELECTRICAL) IDENTIFIERS: NICKEL-CADMIUM CELLS

33

Sixteen batteries each of BB-435()/U, BB-437()/U, BB-438()/U and BB-439()/U
were subjected to the Acceptance Tests of
Paragraph 4.3.1 of Specification SCL-6867B
dated September 18, 1963. The lot for each
battery type was deemed acceptable based on
performance during these tests. Batteries of each
type were subjected to cycling tests of Paragraph
4.3.2 with the objective of meeting 1008 cycles.
The average number of cycles completed was as
follows: BB-435()/U, 1008 cycles; BB437()/U, 859 cycles; BB-438()/U, 617 cycles
and BB-439()/U, 283 cycles. (Author)

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AD- 651 961

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#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

YARDNEY ELECTRIC CORP NEW YORK 650 780

3 DEVELOPMENT OF THE HIGH RATE METAL-AIR DEPOLARIZED BATTERIES.

DESCRIPTIVE NOTE: Rept. no. 5, 1 Jul 65-30 Sep 66 Blossom, Ray ; CONTRACT: DA-28-043-AMC-01614(E) ICO-14501-A-34A-00-08 PROJ: DA-1C0-14501-A-34A 56P MAR 67 (Final)

## UNCLASSIFIED REPORT

01614-5

ECOM

MONITOR:

33 SUPPLEMENTARY NOTE: See also AD-644 366.
DESCRIPTORS: (\*PRIMARY BATTERIES, \*ELECTRODES), AIR,
REDUCTION(CHEMISTRY), POLARIZATION, GAS FLOW, HEAT
TRANSFER, CATHODES(ELECTROLYTIC CELL), ZINC, ELECTRICAL
PROPERTIES, CONSTRUCTION, PERFORMANCE(ENGINEERING) (U)
IDENTIFIERS: ZINC AIR BATTERY CELLS
(U)

3 performance over the current density and temperature range investigated. Of the group of cell systems to +125F. During the fifth, and final, quarterly period the relationship between air supply analysis of these data, a method of correlating cell studied, zinc-air was the only metal-air cell which met ECOM requirements for the 32 volt battery. magnesium, aluminum, calcium, and barium electrodes coupled with an air reducing cathode in aqueous discharge performance of the above cells at various pack temperature with the convective air flow rate was derived. Zinc-air lave best discharge current densities over a temperature range of -25F 32 volt - 10 watt primary metal-air battery with specific energy in excess of WH/1b. The Experimental air polarization data obtained from The goal of this contract was the development of fabricated. Construction and performance details this study are given. From the heat transfer principal work was an investigation of zinc, electrolyte systems. This study included the 26 cell - 16 AH zinc-air batteries were and metal-air cell behavior was studied. are given. (Author)

## UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

MALLORY BATTERY CO TARRYTOWN N Y 10/3 AD- 649 926

3 TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND BATTERIES.

Goodman, Roger ; DESCRIPTIVE NOTE: Final rept., DA-36-039-sc-78320 PROJ: DA-1-C-622001-A-053 TASK: 1-C-622001-A-05302 78320-F 139P MONITOR: ECOM FEB 67 CONTRACT:

# UNCLASSIFIED REPORT

PERFORMANCE(ENGINEERING)), (\*ALKALINE BATTERIES, PERFORMANCE(ENGINEERING)), TESTS, ACCEPTABILITY, ELECTRICAL PROPERTIES, ELECTRIC DISCHARGES, STORAGE, RELIABILITY, TEMPERATURE DESCRIPTORS: (\*PRIMARY BATTERIES,

3

hour rates and at temperatures from -20 to 200F; and storage reliability and delayed-discharge service Testing and evaluating the performance of primary alkaline cells was completed. The cells are of the zinc-alkaline-mercuric oxide system-- the 1R, 12R, 42R, 502R, 625R, 640R, 650R, 143RR and 1450R cell-types. The reported areas of performance are: EMF over 36 months of 70E storage; initial-discharge service from 1/2 to 100for storage temperatures of -20 to 160F and periods of storage up to 36 months. This for all cellinitial discharge at high temperatures; the 1438R and 1450R for initial discharge at low temperatures; the 42R, 502R, 640R and 650R for storage reliability; and the 42R, 502R, 1450R and 650R for retention of service hours types. Also, 1000-hour rate delayed-discharge service for the 42R with storage from -20 to 160F and up to 36 months in length; and service after cyclic-temperature storage for 12R, 625R and 640R cells. Better performance was found in the 42R and 502R for EMF; the 502R and 650R for with storage. (Author)

ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

EAGLE-PICHER INDUSTRIES INC JOPLIN MO COUPLES DEPT

INVESTIGATIONS LEADING TO THE DESIGN AND DEVELOPMENT OF MAGNESIUM/MAGNESIUM PERCHLORATE BATTERIES.

DESCRIPTIVE NOTE: Final rept. and quarterly rept. no. 4, Cupp, Earl B. ; CONTRACT: DA-28-043-AMC-01763(E) 4-1C6-22001-A-053 PRGJ: DA-1C6-22001-A-053 TASK: 1C6-22001-A-053-02 Nov 65-Oct 66, FEB 67 85P

# UNCLASSIFIED REPORT

01763-F

MONITOR: ECOM

(\*CATHODES(ELECTROLYTIC CELL), \*PRIMARY BATTERIES),
MAGNESIUM, MAGNESIUM COMPOUNDS, PERCHLORATES, MANGANESE
COMPOUNDS, DIOXIDES, FEASIBILITY STUDIES, ELECTROLYTES,
CONSTRUCTION, TESTS, ENVIRONMENTAL TESTS, OPTIMIZATION,
ELECTRODES, MATERIALS, \$TORAGE, INDUSTRIAL PRODUCTION,
(U)INDUSTRIAL PRODUCTION
IDENTIFIERS: DEPOLARIZERS(ELECTRICAL), MAGNESIUM
PERCHLORATE, MANGANESE(IV) OXIDE Guidelines for Reserve Batteries (Primary High UPPLEMENTARY NOTE: Rept. on USAECOM Technical Energy). See also AD-643 320. DESCRIPTORS: (\*BATTERY COMPONENTS, DESIGN).

measure the characteristics of the system under various environmental conditions. The report shows the system to be very stable with varying accomplishments during the one (1) year of effort expended on the development of a feasible MnO2/ temperatures and capabile of performing well in at testing are presented. The second portion of the report (Fourth Quarterly Report) details the least one of the field radio operational modes. Mg(C104)2/Mg battery for field radio applications. Details of cell construction and The report summarizes the significant (Author)

## UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL DRDNANCE LAB CORONA CALIF

FC-2 LIQUID AMMONIA RESERVE BATTERY: STATUS OF PROTOTYPE STUDY,

3

NDV 66 61P Daley, John C.; REPT. NO. NOLC-655 TASK: RMMD-22-030/211-1F009-08-001 ,RRE-06017/211-1/ F009-06-05

## UNCLASSIFIED REPORT

3 PERFORMANCE(ENGINEERING), LIQUIDS, BATTERY COMPONENTS, ELECTRIC BATTERIES, ELECTROCHEMISTRY, ELECTRIC DISCHARGES, ELECTRODES, ENERGY CONVERSION, GAS GENERATING SYSTEMS, NITROBENZENES, ANDDES(ELECTROLYTIC CELL), CATHODES(ELECTROLYTIC CELL), LITHIUM, MAGNESIUM, ORGANIC NITROGEN COMPOUNDS IDENTIFIERS: BENZENE/DINITRO, POTASSIUM THIOCYANATE, RESERVE BATTERIES, STEEL 302, THIOCYANATE/AMMONIUM (\*PRIMARY BATTERIES, AMMONIA), DESCRIPTORS:

3

completely self-contained unit, in a volume of 90 cu cm (5.5 cu in.), proved capable of operating for 5 min at a nominal 28 V, 1 A. Performance was satisfactory under simulated missile environments, cell cathode, and the reserve activation feature is provided by storing the electrolyte solvent, anhydrous liquid ammonia, in a separate compartment of the battery case. The basic electrochemical including shock, vibration, spin, and temperature (-54 to +74C or -65 to +165F). An organic oxidant, m-dinitrobenzene (mDNB), is used as the E An investigation was made of the use of the FC-2 system is Mg/KSCN/NH4SCN-mDNB-C/stainless steel (Type 302). The measured volume enersity of this model for a 5 min discharge is 54  $\rm J/cu$ life reserve primary battery applications. The (0.1 Wh/cu in.), and weight enersity is 20 J/ Liquid Ammonia Prototype Battery for short-

3

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g (2.5 Wh/1b). (Author)

3

NAVAL RESEARCH LAB WASHINGTON D C

 $\Xi$ THE PLATE MATERIALS OF THE LEAD-ACID CELL. PART II. ANDDIC OXIDATION OF PBSO4, PB3SO4, 2PBCO3.PB(OH)2, AND ORTHORHOMBIC PBO.

REPT. NO. NRL-6450-Pt-2 PROJ: SF-013-06-06-4366 ,RR-001-01-43-4755 DESCRIPTIVE NOTE: Final rept.,

## UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*ANODES(ELECTROLYTIC CELL), \*STORAGE
BATTERIES), (\*LEAD COMPOUNDS, ANODES(ELECTROLYTIC
CELL)), SULFATES, OXIDES, BATTERY COMPONENTS, ELECTRIC
BATTERIES, CRYSTALLIZATION, OXIDATION, ELECTROLYSIS,
CARBONATES, ANTIMONY

The morphologies of the PbO2 particles resulting from the electrochemical transformations depended upon the source material, and their probable growth mechanisms are discussed. (Author) transformed to agglomerates of nondescript particles gave rise to clusters of prismatic tabular crystals battery plates including lead-calcium cells giving satisfactory and unsatisfactory float performance. dilute sulfuric acid. X-ray diffraction showed that each transformed to beta Pb02. The anodic products were examined in the electron microscope sulfate and 2Pbc03. Pb(0H)2 formed primarily complex dendritic crystals of Pb02; Pb304 and nondescript nedules; and orthorhombic Pb0 was crystallization. These forms of crystallization are compared with those observed in commercial material pastes of the lead-acid cell (PDSD4, PD3D4, 2PDCO3 . Pb(DH)2, and orthorhombic Four compounds commonly resent in the active showing no evidence of prismatic dendritic

## UNCLASSIFIED

ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

BATTERY CORP OF AMERICA FORT LAUDERDALE FLA AD- 643 545

NEW MAGNESIUM ANDDE STRUCTURE

3

DESCRIPTIVE NOTE: Semiannual rept. no. 1, 1 Mar-31 Aug

Balaguer, Rodolfo R. DA-28-043-AMC-01998(E) 55P 99 REPT. NO. CONTRACT: NON N

,1C6-22001-A053-02-24 PRGJ: DA-1C6-22001-A053 TASK: 1C6-22001-A053-02 01998-MONITOR: ECOM

## UNCLASSIFIED REPORT

"ESCRIPTORS: (\*ANODES(ELECTROLYTIC CELL), MAGNESIUM), (\*DRY BATTERIES, BATTERY COMPONENTS), PRIMARY BATTERIES, BINDERS, THERMOSETTING PLASTICS, CONTAINERS, STORAGE, PACKAGING, (U) PACKAGING DESCRIPTORS:

contracts except for an improved carbon cup which utilizes a thermosetting resin binder instead of the performance have been observed between ceils using maintenance at 130F has been over 90 pe cent at up demonstrated and work is under way on equipment to make this size cell using the same design and coal tar pitch formerly used. Eleven experimental lots have been made and put on test to evaluate various materials for the cell jacket, the anode sealing washer and the insulating and reinforcing The basic 'D' cell made on this contract has the materials of construction as are used in the 'D' same construction as that developed on previous tape. At this time, no definite differences in to three months. Uniformity has been good. The different materials of construction. Capacity feasibility of making a 'C' cell has been cell. (Author)

UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

MALLORY (P R) AND CO INC BURLINGTON MASS LAB FOR PHYSICAL SCIENCE AD- 643 378

3 EVALUATION OF RECHARGEABLE LITHIUM-COPPER CHLORIDE ORGANIC ELECTROLYTE BATTERY SYSTEM.

DESCRIPTIVE NOTE: fechnical rept. no. 1, Mar-Sep 66, SEP 66 80P Rao,M. L. B. ;Hill,K. R.; CONTRACT: DA-44-009-AMC-1537(T)

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*STORAGE BATTERIES, ELECTRICAL PROPERTIES), (\*ANODES(ELECTROLYTIC CELL), \*LITHIUM), (\*CATHODES(ELECTROLYTIC CELL), \*COPPER COMPOUNDS), CHLORIDES, ELECTROLYTES, ORGANIC MATERIALS, PROPENES, CARBONATES, ALUMINUM COMPOUNDS, ELECTRIC DISCHARGES, GRAPHITE, ELECTROCHEMISTRY, IMPURITIES, (CAPPER COLLORIDE, LITHIUM—COPPER CHLORIDE CELLS, ORGANIC BATTERIES

3

copper chloride in 1M LiAIC14 in propylene carbonate was investigated to evaluate the lithium-copper chloride high energy density battery system. Impurities present in solution caused a significant self-discharge of iithium and increased the coppper substrate, the current density and the loading. The utilization efficiency of lithium depended on The electroformation and discharge of lithium and discharge was found to be the principal mechanism salt solubility. The formation of highly soluble chloro-cuprate complexes of copper salts during electrode is possible under suitable conditions. The operation of a rechargeable cupric chloride resulting in loss of cathode efficiency.

## UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

- 640 053 10/3 13/8 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J 10/3 AD- 640 053

DRY PROCESS DIVALENT SILVER OXIDE ELECTRODES

3

Wilburn, Nicholas T. ; Bradley, Technical rept. 19P DESCRIPTIVE NOTE: 99 SEP

Charles J. ; REPT. NO. ECOM-2749, PROJ: DA-1C622001A053 1C622001A05302 TASK:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*GUIDED MISSILE BATTERIES, ELECTRODES),

'\*ALKALINE BATTERIES, ELECTRODES), (\*ELECTRODES, SILVER
COMPOUNDS), OXIDES, MANUFACTURING, MECHANICAL
PROPERTIES, BINDERS, VIBRATION
IDENTIFIERS: SILVER OXIDE, SILVER ZINC BATTERY SUPPLEMENTARY NOTE:

3 3

The development of the dry process method, a new

3 reliability, particularly under missile environments. technique for fabricating divalent silver oxide (AgO) electrodes for use in zinc-silver oxide batteries, was accomplished at USAECOM and reported in AD-622 698. This report indicated that these which could simplify production methods and thereby This report presents evidence of high mechanical strength of the dry process electrodes, sufficient electroformed electrode and an important factor in for missile usage. It also presents data on an improvement in the dry process, the elimination of the sodium carboxymethylcellulose (CMC) binder, electroformed ones in many respects such as cost, voltage regulation and discharge efficiency. Evidence was lacking, however, as to comparable mechanical strength, a strong point of the electrodes were superior to the conventional further reduce costs. (Author)

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(Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

10/3 ELECTRIC STORAGE BATTERY CO YARDLEY PA

HIGH ENERGY SYSTEM (ORGANIC ELECTROLYTE).

3

DESCRIPTIVE NOTE: Final rept. 15 Jun 65-14 Jun 66, SEP 66 126P Boden,D. P. ;Buhner,H. R. ; Spera.V. J.; CONTRACT: DA-28-043-AMC-01394(E), PROJ: DA-1C6-22001-A-053. TASK: 1C6-22001-A-053-02,

# UNCLASSIFIED REPORT

01394-F

DESCRIPTORS: (\*BATTERY COMPONENTS, ORGANIC MATERIALS), (\*ELECTROLYTES, ORGANIC MATERIALS), (\*WET CELLS, ORGANIC MATERIALS), (\*WET CELLS, ORGANIC MATERIALS), CARBONATES, SULFITES, LITHIUM COMPOUNDS, PERCHLORATES, ANDDES(ELECTROLYTIC CELL), LITHIUM, FOILS(MATERIALS), CATHODES(ELECTROLYTIC CELL), LOPPER COMPOUNDS, FLUORIDES, BINDERS, BATTERY SEPARATORS, ELECTRICAL PROPERTIES, (U) ELECTRICAL PROPERTIES (U) ELECTRICAL PROPERTIES, OPPER(II) FLUORIDE, LITHIUM PERCHLORATE, ORGANIC BATTERIES, PROPYLENE CARBONATE (U) SUPPLEMENTARY NOTE: DESCRIPTORS: (\*BAT

3 from commercially available foil could be discharged over a wide range of current densities yielding high coulombic efficiency without appreciable polarization. The most encouraging techniques for cupric fluoride cathode fabrication were found to be The report describes a project to develop a system capable of delivering energy in excess of 200 w-hrs/1b of total battery weight. Screening tests at the a hot pressing method using polyethylene as a binder beginning of the program indicated that the lithium/ cupric fluoride system offered the best possibility of success. Electrolyte studies indicated that the most promising solvents were propylene carbonate, electrolytes having adequate conductance and which dimethy! carbonate and dimethy! sulphite which in were inert towards the electrode materials. Anode studies revealed that lithium electrodes prepared and a cold press ag method using paper floc as a containing nine electrodes and having a nominal binder. Multiplate assemblies were constructed conjunction with lithium perchlorate yielded capacity of 7 a.h.

## UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

- 639 489 13/10 10/3 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

REPLACEMENT OF LEAD ACID STORAGE BATTERIES WITH ALKALINE ONES ON 'ROCKET' TYPE SHIPS.

3

Andreev, N. ; Nalebin, V. ; MONITOR: TI 66-62351

## UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: Unedited rough draft trans. of Rechnoi Transport (USSR) n7 p42-3 1964.
DESCRIPTORS: (\*SHIPS, BATTERY COMPONENTS), (\*STORAGE BATTERIES, SHIPS), (\*ALKALINE BATTERIES, SHIPS), HYDROFOIL CRAFT, ELECTRICAL EQUIPMENT, USSR, (U)USSR

3 'Rocket' ('Raketa') class hydrofoil boats to accept alkaline cells in place of lead-acid storage Modification of the electrical system of the batteries is described.

UNCLASSIFIED

AD- 639 709

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

- 638 888 10/3 7/4 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

CHEMICAL CURRENT SOURCES

3

428P Dasoyan, M. A. ; 66-62235 FTD-TT-66-7, MONITOR:

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Unedited rough draft trans. of mono. Khimicheskie Istochniki Toka, Moscow/Leningrad, 1961 350p.

33 COMPONENTS, TEXTBOOKS), DRY BATTERIES, WET CELLS, ELECTROCHEMISTRY, THEORY, ELECTRIC CURRENTS, MANGANESE, OXYGEN, ZINC, MERCURY, LEAD(METAL), SILVER, COPPER, MAGNESIUM, NICKEL, CADMIUM, IRON, ALKALINE BATTERIES, BATTERY COMPONENTS, ELECTRIC BATTERIES, ELECTRODES, ANTIMONY, ELECTROLYTES, USSR, (U)USSR (U) DESCRIPTORS: (\*STORAGE BATTERIES, TEXTBOOKS), (\*BATTERY

3 the choice of storage batteries for various operating voltaic elements produced industrially is discussed The book is designed for engineers and technicians sources are described. Safety techniques employed in working with storage batteries are considered. The book gives basic information on the most important forms of chemical current sources. The variety of alkal and lead storage batteries and together with their electrical and service characteristics. Recommendations are made as to conditions. The properties of the materials employed in the manufacture of chemical current concerned with the production or operation of chemical current sources. (Author)

## UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO 10/3

3 DISCHARGE MONITORING MEDIA AND SYSTEM OF AUTOMATIC CHARGING OF ALKALI STORAGE BATTERIES

Malevanaya, S. V. ; Plotnikov, Yu. FTD-TT-65-1896, 8 REPT. NO. FTD MONITOR: TT 99

# UNCLASSIFIED REPORT

66-62223

ISCRIPTORS: (\*STORAGE BATTERIES, MAINTENANCE), ELECTRIC DISCHARGES, MONITORS, MAINTENANCE EQUIPMENT, USSR (1 SUPPLEMENTARY NOTE: Unedited rough draft trans. of Byulleten Tekhniko-Ekonomicheskoi Informatsii (USSR), n8 p18-20 1961. DESCRIPTORS: (\*STORAGE BATTERIES, MAINTENANCE)

blocking relay, the two of which in the assembly with changing of the storage batteries consists of a plugthe counter of electric energy, assure the automatic cutting in on charging and cutting out on finishing on which there is mounted a two-pole automatic unit, and in the other a counter of electrical energy.

As the counter, there is used a mercury indicator of the energy received by the battery (in amperehours) in the charging and the amount of it leaving the battery in the discharging. The system of the automatic charging of the battery (see drawing) consists of a relay of voltage and current and a chamber explosion-proof body in one of the chambers The means for the monitoring of the discharging and Current protection and a counter of ampere hours. The plug-in automatic device represents a twoin automatic device, the ShA-1, with a maximum the discharging.

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVY MARINE ENGINEERING LAB ANNAPOLIS MD 638 603 AD-

NICKEL-CADMIUM BATTERY RECONDITIONER

3

DESCRIPTIVE NOTE: Research and development rept. Ford, Floyd E. ; MEL-183/66 32P

# UNCLASSIFIED REPORT

33 DESCRIPTORS: (\*STORAGE BATTERIES, \*BATTERY CHARGERS), MAINTENANCE, TEST EQUIPMENT, SATELLITES(ARTIFICIAL), IDENTIFIERS: NICKEL-CADMIUM CELLS SUPPLEMENTARY NOTE: POWER SUPPLIES

3 accomplished by individual cell shunting transistors and a battery current shunt transistor. Cell reversal is prevented by cutting off the battery dump reconditioning a nickel-cadmium battery. Individual cell voltage detectors and/or a battery reconditioning is necessary. Reconditioning is accomplished by discharging each cell to nearly 0 volts, then recharging the battery at a small current. Controlled discharge of the battery is current when a cell voltage reaches a low limit. terminal voltage are utilized to determine when device has been designed for automatically (Author)

## UNCLASSIFIED

ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

NAVAL ORDNANCE LAB CORONA CALIF AD- 637

INVESTIGATIONS OF CHEMOELECTRIC CONVERSION IN FUSED SALTS (II).

3

Panzer, Richard E. DESCRIPTIVE NOTE: Technical memo REPT. NO. NOLC-TM-44-10, 386

## UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, DESIGN), (\*THERMAL BATTERIES, TESTS), ANDDES(ELECTROLYTIC CELL), CATHODES(ELECTROLYTES, SALTS, ELECTRODES, ELECTRICAL CONDUCTIVITY, INSTRUMENTATION, URANIUM, URANIUM COMPOUNDS, OXIDES, ABSTRACT, COPPER COMPOUNDS, ACETAMIDES, LITHIUM COMPOUNDS, HYDROXIDES, CHLORIDES, NITRATES, POTASSIUM COMPOUNDS, EUTECTICS, (U)EUTECTICS SUPPLEMENTARY NOTE:

3 3 IDENTIFIERS: COPPER(II) OXIDE, FUSED SALTS, LITHIUM CHLORIDE, LITHIUM NITRATE, LITHIUM HYDROXIDE, POTASSIUM CHLORIDE, URANIUM(IV) OXIDE

3 A summary of techniques and results of approximately 300 thermal cell tests leading to the production of high-power, long-life batteries review of experiments with alloy anodes, cathode materials, new electrolytes, reference electrode development, electrical conductivity, and instrumentation developed for various phases of assembled in minimum-size containers. Included thermal cell research. (Author)

AD- 638 603

ZOM07 SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

SONOTONE CORP ELMSFORD N Y 10/3

3 R/D CONTRACT FOR THE DEVELOPMENT OF A 20-CELL FIBERGLASS CASED BB501()/U BATTERY.

DESCRIPTIVE NOTE: Final rept., 30 Jun 65-15 Mar 66 Herrmann, John ; Fitchman, 66 144P

Arthur :d'onofrio.Elmer A. : CONTRACT: DA-28-043-AMC-00222(E), PROJ: DA-1C6-22001-A-053,

00222-F MONITOR: ECOM

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), NICKEL, CADMIUM, GLASS TEXTILES, CONTAINERS, REINFORCING MATERIALS, ENVIRONMENT TESTS, SPECIFICATIONS, MECHANICAL DRAWING (U) SUPPLEMENTARY NOTE:

3 This report covers the research and development activities which have been directed towards the design of a 24-volts, vented, nickel-cadmium battery housed in a reinforced fiberglas container and turn, is hard-mounted within a reinforced fiberglas steel inner box which clamps two banks of 10 cells each to make a rigid assembly. This assembly, in magnitude of compressive loads induced by impact. Essentially, the structural system consists of a outer box to cause its walls to be preloaded in tension. This preload tends to reduce the capable of surviving four-foot free fall drops. (Author)

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SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB AD- 636 153 OHIO

SEALED AIRCRAFT BATTERIES.

3

Marsh, R. A. ; DESCRIPTIVE NOTE: Technical paper. REPT. NO. AFAPL-CONF-66-3, 186 MAY

AF-1873, TASK: 817304, PROJ:

# UNCLASSIFIED REPORT

City, N. J., 24-26 May 1966. DESCRIPTORS: (\*ALKALINE BATTERIES, AIRCRAFT EQUIPMENT), SUPPLEMENTARY NOTE: Prepared for presentation at the Annual Power Sources Conference (20th), Atlantic

SEALS(STOPPERS), MAINTENANCE, NICKEL, CADMIUM, PERFORMANCE(ENGINEERING), LIFE EXPECTANCY, COMPATIBILITY, AIRBORNE

3

aircraft applications is considered possible by late 1968. Sealing the battery and integrating it with the aircraft electrical system introduces several the proper voltage on charge, eliminating cell internal pressure buildup, developing reliable failmajor problems: compatibility with the environment and electrical system of the aircraft, providing a fast recharge capability, selecting and maintaining Technological advances in sealed alkaline batteries safe features, and maintaining sealed operation for Utilization of sealed nickel-cadmium batteries for solve or to minimize these problems. The technical approaches include: improvement of electrochemical extended time periods. Efforts are in progress at are: improved flight safety, reduced maintenance, longer service life, compatibility with aircraft electrical system, and system weight reduction. approaches, the progress in problem solution, and and battery charge - charge conditioning control techniques make the sealed battery system an performance, end-of-charge control techniques, systems over existing vented aircraft batteries attractive candidiate for aircraft application. Forecasted major advantages of sealed battery the Air Force Aero Propulsion Laboratory to supporting technical data are reviewed. The

AD- 636 153

3

UNCLASSIFIED

AD- 635 776 10/3
YARDNEY ELECTRIC CORP NEW YORK

3 DEVELOPMENT OF THE SEALED ZINC - SILVER DXIDE SECONDARY BATTERY SYSTEM.

DESCRIPTIVE NOTE: Final technical rept. no. 8, 1 Jul 63-Sulkes, Martin ; PROJ: DA-3A99-09-022, DA-1C6-22001-A-053 CONTRACT: DA-36-039-AMC-02238(E), 66 176P 02. 30 Jun 65.

UNCLASSIFIED REPORT

02238-F

MONITOR:

33 SUPPLEMENTARY NOTE: See also AD-621 583.
DESCRIPTORS: (\*ALKALINE BATTERIES, \*STORAGE BATTERIES), (\*BATTERY SEPARATORS, STORAGE BATTERIES), PERFORMANCE(ENGINEERING), HERMETIC SEALS, LIFE EXPECTANCY, SILVER COMPOUNDS, OXIDES, REACTION KINETICS, ANDDES(ELECTROLYTIC CELL) CATHODES(ELECTROLYTIC

DENTIFIERS: SILVER ZINC BATTERY CELLS

3 cells were the most important factors in the reaction investigated during overcharge and on stand. The electrolyte level and the type of separator used in with temperature, potential, the addition of Pd to 316-621/2 depth of discharge cycles, were obtained separator materials were evaluated. Of the group, only S5520 warrants further testing. Evaluation cycling and cycle life data were obtained for 244 sealed silver zinc cells. The best results, up to from a cell with a 62% porous positive electrode, hydrogen reaction showed that the rate increased zinc reacts with the oxygen generated during reversal. Physical, chemical, and electrical properties are presented for many separator and interseparator materials. Several inorganic Sealed AgZn cells may be over discharged at the C/4 rate without developing excessive pressure. Electrochemically inactive or non-dischargeable 840 in the negative electrode, 42% KOH, and a separator consisting of 1 turn Pellon 6/51 Teflon binder, 2% HgO and 1% Emulphogene BC the Ag and the mobility of the electrolyte. The reaction between 2n and oxygen was rate. Investigation of the Ag0-Ag20

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 634 845 10/3 1/3
AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB

SEALED NICKEL-CADMIUM BATTERIES FOR AIRCRAFT ELECTRICAL SYSTEMS,

3

Miller, Gerald H. ; JUL 66 14P Mi REPT. NO. AFAPL-Conf-66-6, PROJ: AF-8173,

UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, AIRCRAFT EQUIPMENT), NICKEL, CADMIUM, POWER SUPPLIES STORAGE BATTERIES, MAINTENANCE, PERFORMANCE(ENGINEERING), SEALS(STOPPERS (U) UPPLEMENTARY NOTE: Prepared for presentation at the IEEE SUPPLEMENTARY NOTE: Seattle, wash.

systems is feasible. The major problem to be solved is the development of a suitable charge conditioner to operate with the battery and the aircraft electrical system. The interchanging of vented-cell, nickel-cadmium aircraft batteries with improved flight safety, maintenance-free operation, Sealed-cell, nickel-cadmium aircraft batteries is advantages of sealed-cell aircraft batteries are Adapting sealed batteries to aircraft electrical and improved performance in terms of life and considered possible by mid-1968. The major reliability. (Author)

3

AD- 634 845

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DOC REPORT. BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 634 100 10/3 ARMY ELECTRONICS COMMAND FORT MONMOUTH N J LOW-COST, HIGH-ENERGY CATHODES FOR MAGNESIUM PERCHLORATE BATTERIES.

3

DESCRIPTIVE NOTE: Technical rept.,
APR 66 22\* Almerini, Achille L.
REPT. NO. ECOM-2694,
PROJ: DA-1C6-22001-A-053,
TASK: 1C6-22001-A-053-02,

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:
DESCRIPTORS: (\*CATHODES(ELECTROLYTIC CELL), \*STORAGE
DESCRIPTORS: (\*CATHODES(ELECTROLYTIC CELL), \*STORAGE
COMPOUNDS, DIOXIDES, MITROBENZENES, COSTS,
POLARIZATION
IDENTIFIERS: DINITRO BENZENES, MAGNESIUM PERCHLORATE,
MANGANESE(IV) OXIDE
(U)

energy depolarizer on an inexpensive grid to replace cost, would make possible the development of a much cupric oxide and meta-dinitrobenzene. Data is also presented on various halide depolarizers which did not prove to be nearly as promising. It appears that especially m-dinitrobenzene and manganese presents findings and preliminary room temperature will surpass the performance of mercuric oxide in primarily for three materials: manganese dioxide, the mercuric oxide on silver cathode. The report needed, inexpensive, highly efficient expendable battery for operation from -40F to +125F for investigations on establishing a low-cost, high-Mercuric oxide cathodes on expanded silver grids dioxide can be developed to the point where they magnesium perchlorate reserve type batteries. However, high cost and the critical category of paractical cells. This. coupled with their low have proven their effectiveness in magnesium/ modern communication applications. (Author) discharge data at a medium (two-hour) rate both mercury and silver compounds led to

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMD7
AD- 631 951 10/3 22/2 9/5

ID- 631 951 10/3 22/2 9/5
NAVY MARINE ENGINEERING LAB ANNAPOLIS MD

SHUNT VOLTAGE REGULATOR CIRCUIT FOR NICKEL-CADMIUM CELLS WITH AUXILIARY ELECTRODES,

3

APR 66 33P Ford, Floyd E.; Liwski, Piotr P. M.; REPT. NO. MEL-93/66, PROJ: NASA-S-12730-G

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:
DESCRIPTORS: (\*ALKALINE BATTERIES, \*CIRCUITS),
(\*VOLTAGE, CIRCUITS), (\*ELECTRIC SHUNTS, VOLTAGE),
ELECTRODES, ONTROL, SATELLITE NETWORKS, WEIGHT,
TEMPERATURE, OPTIMIZATION, NICKEL, CADMIUM
IDENTIFIERS: NICKEL-CADMIUM CELLS

33

A circuit to control charge current entering nickel—cadmium cells with auxiliary electrodes ('threeterminal' cells) using a shunt method of control was developed for use in satellite power systems requiring minimum weight and space with optimum control and temperature compensation. Reduction in charge current is caused when the set limits of either the total battery terminal voltage, or the potential of any individual cell at this auxiliary electrode, is exceeded. (Author)

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AD- 631 951

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

JOHNS HOPKINS UNIV SILVER SPRING MD APPLIED PHYSICS 22/2 10/3

A COMPARISON OF SILVER-CADMIUM AND NICKEL -CADMIUM BATTERIES FOR USE ON SATELLITES,

Radford, Wade E. ; NOW-62-0604-C. CF-29070A 29P CONTRACT:

## UNCLASSIFIED REPORT

(\*SATELLITES(ARTIFICIAL), BATTERY COMPONENTS), NICKEL, SILVER, CADMIUM, SOLAR CELLS, COMPATIBILITY, ELECTRICAL PROPERTIES, WEIGHT, VOLUME, POWER, (\*ALKALINE BATTERIES, SPACEBORNE), SUPPLEMENTARY NOTE: DESCRIPTORS:

3 DENTIFIERS: NICKEL-CADMIUM CELLS, SILVER-CADMIUM CELLS

power system designers is to decrease the weight and between temperature of the secondary cells and their replacement of Ni-cd batteries with Ag-cd batteries.is reported to decrease the weight, while maintaining the capacity, of a given power system. This paper is the result of an investigation of this possibility. Areas investigated were: (1) The capability of a solar cell Ag-cd cell system. The power system used on many near earth satellites battery. This combination has been used satisfactorily on satellites. A constant goal of compatibility of solar cells and Ag-Cd cells in and volume advantages in the use of Ay-Cd cells end of charge and discharge voltages for Ni-Cd increase the reliability of such systems. The consists of a solar cell charger and a Ni-Cd such a power system. (3) The relationship and Ag-Cd cells. (4) The relative weight to limit overcharge current. (2) The over Ni-Cd cells. (Author)

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SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J INST FOR EXPLORATORY RESEARCH 10/3 AD- 629 501

3 THIN-FILM RECHARGEABLE SOLID-ELECTROLYTE BATTERIES,

Mrgudich.J. N. ; Bramhall, P. J. Revised ed., 8 Finnegan, J. J.; DESCRIPTIVE NOTE: SEP 65

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*DRY BATTERIES, ELECTROLYTES),
(\*ELECTROLYTES, RECLAMATION), SOLIDS, FILMS, MINIATURE
ELECTRICAL, LIFE EXPECTANCY, OXIDATION-REDUCTION, SILVER
COMPOUNDS, IODIDES, PLATINUM, SILVER Revision of manuscript submitted 29 Aerospace and Electronic Systems vAES-1 n3 p290-6 Dec 1965. Copies to DDC users only. Availability: Published in IEEE Transactions on IDENTIFIERS: THIN FILMS SUPPLEMENTARY NOTE:

working on concentrationcell rather than conventional capability. In addition, they appear amenable to development effort leading to a thin-film, printable battery with application possibilities. (Author) used to show that substitution of solid electrolytes for conventional liquid electrolytes can enhance battery miniaturization potential without sacrifice reduction processes taking place in the dry cell is oxidation-reduction principles, have significantly lower internal resistance. Such cells can be made quite small (possibly down to 0.002 cc per cell), have apparently excellent shelf life, and are operable at 100C. Moreover, they show a recharge electrolyte batteries, however, exhibited prohibitively high internal resistance. Solidelectrolyte batteries of the type Ag-Ag-Pt, A brief description of the basic oxidationof shelf life. Previously developed solid-

SEARCH CONTROL NO. ZOMOT DDC REPORT BIBLIOGRAPHY

EAGLE-PICHER CO JOPLIN MO COUPLES DEPT 10/3 AD- 629 419

ADVANCED DEVELOPMENT MODELS OF VENTED NICKEL-CADMIUM BATTERIES.

DESCRIPTIVE NOTE: Acceptance test rept.,
DEC 65 49P LaFollette, H. H. :
CONTRACT: DA-28-043-AMC-00065(E),
PROJ: DA-1C6-22001-A-053, TASK: 1C6-22001-A-053-02,

UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, TESTS), PERFORMANCE(ENGINEERING), NICKEL, CADMIUM, TABLES(DATA) SUPPLEMENTARY NOTE:

IDENTIFIERS: NICKEL-CADMIUM CELLS

33

Sixteen (16) batteries each of BB-435/U, BB-437/U, BB-438/U and bb-439/U were subjected to acceptance tests. The lot for each battery type was deemed acceptable based on performance during these tests. (Author)

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## UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY AD- 628 299

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHID 10/3

METHOD OF STORING ELECTRICAL ENERGY

3

Zaev, N. E. 66-60575 REPT. NO. FTD-TT-64-485, MONITOR: TT , 66-6 NOV

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Unedited rough draft trans. of Patent (USSR) 153 985, appl. 740615/26-10, 31 Jul 61.

DESCRIPTORS: (\*STORAGE BATTERIES, USSR), ELECTRODES, DIELECTRICS, ELECTROSTATIC GENERATORS, VOLTAGE, ELECTRICAL ENGINEERING, BATTERY COMPONENTS, ELECTRIC BATTERIES

3

dielectric undergoes a long charging at high temperature (relative to the operating temperature on discharging) by a high voltage close to the disruptive. From contact metallized surfaces a high voltage of D C microcurrent is obtained. The proposed method is attained by the use as storing material a solid dielectric with predominately electron conductivity. The

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AD- 628 299

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NAVAL CIVIL ENGINEERING LAB PORT HUENEME CALIF

3 HIGH-PRESSURE PERFORMANCE OF VOLTAIC CELLS.

DESCRIPTIVE NOTE: Final technical rept. Jan-Feb 65, Hitchcock, R. D. ; Y-R011-01-01-090 JAN 66 19P REPT. NO. NCEL-TR-422 PROJ: Y-R011-01-01-00-

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, HIGH-PRESSURE), UNDERWATER, SEA WATER, TEST, PERFORMANCE(ENGINEERING), THEORY, DILS, MAGNESIUM. COPPER, LEAD(METAL), INDRGANIC ACIDS, UNDERWATER IDENTIFIERS: SEA WATER TESTS DESCRIPTORS:

3 of a magnesium-copper electrolytic couple immersed in seawater under pressures up to 18,000 psi. The cell voltage was not affected by pressure from a on the side of complete reaction in one direction to allow measurement of the free energy of formation of magnesium dissolves in water, equilibrium is too far indicate that cell performance is unaffected by pressure in this range. Two theories are discussed which attempt to explain the fact that the observed open-circuit voltage of the Mg - Cu cell is more vacuum of 3 centimeters of mercury to a pressure of 18,000 psi. Measurements were also taken on the voltage of a lead-acid cell immersed in oil under pressures from atmospheric to 20,000 psi. Results than a volt below the voltage calculated from half-Measurements were taken on the open-circuit voltage reaction potentials. One theory assumes that adsorbed H atoms alter the work function of the electrode; the other theory proposes that, when the aqueous magnesium ion. (Author)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 626 229 10/3 7/2 7/4

DEFENCE CHEMICAL BIDLOGICAL AND RADIATION LABS OTTAWA (ONTARIO)

3 STUDIES ON THE STABILITY OF OXIDES OF SILVER,

7P Nagy, G. D. ; Moroz, W. J. ; Casey, REPT. NO. DCBRL-460

# UNCLASSIFIED REPORT

Annual Power Sources Conference (19th) 1965.
Copies to DDC users only.
SUPPLEMENTARY NOTE: Prepared for presentation at the Annual Power Sources Conference (19th), Atlantic City, N. J. May 18-20 1965.
DESCRIPTORS: (\*STORAGE BATTERIES. CATALYSTS), (\*SILVER COMPOUNDS, STABILITY), OXIDES, PYROLYSIS, CHEMICAL ANALYSIS, SYNTHESIS(CHEMISTRY), OXIDATION REDUCTION Availability: Published in Proceedings of the IDENTIFIERS: SILVER OXIDE REACTIONS

33

3 theoretical and experimental standpoints. Some new information is reported on preparation and properties oxides themselves, i.e. without stabilizing ligands. A start was made on a method of characterizing chemically-prepared AgO, both from the The goal of the work was a better understanding of the mechanism of thermal decomposition of silver of anodically formed wet 'Ag203.'

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

UNION CARBIDE CORP CLEVELAND OHIO ELECTROCHEMICAL PRODUCT DEVELOPMENT LAB

3 ALKALINE-MNO2 BATTERY

DESCRIPTIVE NOTE: Rept. no. 8 (Final), 1 May 62-31 Jan 65

JUN 65 105P Winger, J.; CONTRACT: DA36 039sc89098 PROJ: 1C6 22001A053 CONTRACT:

# UNCLASSIFIED REPORT

33 SUPPLEMENTARY NOTE: Available copy will not permit full legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale. See also AD-433 225.

DESCRIPTORS: (\*ALKALINE BATTERIES, PERFORMANCE(ENGINEERING)), (\*LOW TEMPERATURE BATTERIES, CONSTRUCTION), MANGANESE COMPOUNDS, DIOXIDES, CATHODES(ELECTROLYTIC CILLS), ELECTROLYTES, BINDERS, ZINC, LIFE EXPECTANCY, STORAGE, BATTERY SEPARATORS, ANDDES(ELECTROLYTIC CELLS), MANUFACTURING (UIDENTIFIERS: MANGANESE(IV) OXIDE

characteristics of the mix were not practical from a construction optimization showed that the type mixer The importance of cathode density was established as low temperature service was adversely affected by low density cathodes. Service life was also additives improved shelf life but reduced service at obtained. A 4 per cent binder level in the cathode was optimum and repeat laboratory trials confirmed the improvement in high temperature shelf life. improve the low temperature service of the cathode generally 100 per cent. Mixing and molding high temperature storage which reduced the packing determined and a factory trial of low temperature cells was made. The cathode absorbed liquid during improved by using Pellon separator paper. Anode performance at low temperature but the handling parameters for optimum cathode manufacture were Addition of a binder corrected the problem and maintained the service improvement previously A lower ore/carbon ratio (4:1) was found to low temperature. Further work on cathode used for LeClanche cells improved Cell manufacturing standpoint.

## UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

EAGLE-PICHER CO JOPLIN MO COUPLES DEPT

3 ADVANCED DEVELOPMENT MODELS OF SEALED NICKEL-CADMIUM BATTERIES.

DESCRIPTIVE NOTE: Final rept. for 5 Apr 64-18-Aug Aug 65 20P Wilson, Jeff K.; REPT. NO. NA-122

CONTRACT: DA28 043AMC00070E PROJ: 1C6 22001A053

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, ALKALINE BATTERIES), NICKEL, CADMIUM, HERMETIC SEALS, CERAMIC MATERIALS, ELECTROLYTES, POTASSIUM COMPOUNDS, HYDROXIDES, BATTERY SEPARATORS, PLASTICS, LIFE EXPECTANCY, SUPPLEMENTARY NOTE: DESCRIPTORS:

3

batteries. The work has been directed toward the attainment of a new line of nickel-cadmium batteries in accordance with the Signal Corps Technical Requirements SCL-6868B. The batteries have Ceramic seals, sintered nickel plaque plates, pellon 40F, meet stand test requirements at +80F and +160F, undergo temperature cycling, mechanical shock, acceleration, vibration, constant overchange, and cycle life tests. Early models of these batteries have passed all these requirements except those for cycle life. Emphasis was placed on cell and polypropylene separation, and contain 1.300 sp. gr. KOH electrolyte. The batteries must meet the Development and production work has been directed specifications require batteries to discharge at capacity, high rate discharge, storage at +160F, and constant overcharge using BB-467/U batteries toward the production of forty (40) each BB-467/u, BB-468/u, BB-469/u, BB-470/u, BB-471/u, and BB-472/u sealed nickel-cadmium specifications as stated in SCL-6868B. These for the development units. (Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

EAGLE-PICHER CO JOPLIN MO COUPLES DEPT

INVESTIGATIONS LEADING TO THE DESIGN AND DEVELOPMENT OF MAGNESIUM/MAGNESIUM PERCHLORATE BATTERIES.

DESCRIPTIVE NOTE: Rept. no. 4 (Final), 1 Jul 64-30 Jun 65

Sharpe, James R. ; JUL 65 91P Shair

DA-1C622001A053 1C622001A05302 PROJ:

## UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, MAGNESIUM), (\*MAGNESIUM), STORAGE BATTERIES, MAGNESIUM), PERCHLORATES, DESIGN, ELECTROLYTES, MERCURY COMPOUNDS, OXIDES, MAGNESIUM ALLOYS, FREEZING POINT DEPRESSANTS (U) OXIDE

accomplishments made on the research and development Data concerning voltage and temperature vs. type of magnesium/ magnesium perchlorate batteries. magnesium alloy are presented. Performance The report describes the significant

for three military field applications were developed freezing point depression are discussed. Batteries to meet the desired specifications. (Author) Variations of electrolyte concentration and

characteristics of Mg-HgO multicell batteries

at low and high temperatures are discussed.

## UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

ROCKETDYNE CANOGA PARK CALIF

HIGH ENERGY BATTERY SYSTEM STUDY

3

DESCRIPTIVE NOTE: Rept. no. 8 (Final), 1 Jul 63-30

Farrar, J. ; Keller, R. JUN 65

Nicholson, M. N. ; REPT. NO. R-5405-8 CONTRACT: DA36 039AMC03201E PROJ: DA-1C622001A053

TASK: 1C62001A05302

# UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE: See also AD-617 714.

DESCRIPTORS: (\*PRIMARY BATTERIES, ELECTROCHEMISTRY), (\*ELECTRODES, MATERIALS), (\*ELECTROLYTES, ORGANIC MATERIALS), (\*ELECTROLYTES, ORGANIC MATERIALS), LITHIUM, MAGNESIUM, ALUMINUM, CYANOGEN, BROWIDES, CHLORIDES, COPPER COMPOUNDS, SILVER COMPOUNDS, BROWINE, CABBONATES, PERFORMANCE(ENGINEERING)

IDENTIFIERS: COPPER(II) CHLORIDE, COPPER(II) FLUORIDE, CYANOGEN BROMIDE, SILVER BROMIDE

proved to be the most promising although performances were less favorable at higher current densities. Bromine and water showed the best prospect for attaining the performance goal although they can only was favored as the electrolyte solvent for a lithium cell, with 0.03/ohm/cm being the highest conductivity examined during subsequent tests. Lithium emerged as the outstanding anode material with a mean open circuit potential of -2.71 volts vs Ag/AgBr, limiting currents exceeding 10 ma/sq. cr., and utilization efficiencies of approximately 100 percent. Two dozen solids were tested as potential cathode sq. cm. materials. At low discharge rates of 1 to 5 ma/sq. cm. BrCN, CuCl2, and CuF2 anode materials in statistically planned experimentation. Calcium and beryllium were also Lithium, magnesium, and aluminum were studied as be used in reserve systems. Propylene carbonate value observed for organic aprotic electrolytes. Calculations show that BrCN, CuCl2 or CuF2 cathodes coupled with lithium anodes can meet the performance goals for this program.

AD- 622 818

(Author)

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SEARCH CONTROL ND. ZOMO7 DOC REPORT BIBLIOGRAPHY

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO AD- 622 423

SILVER ZINC STORAGE BATTERY.

65-64170 FTD-11-65-809 REPT. NO.

# UNCLASSIFIED REPORT

Stribrozinkovy Akumulatorovy Clanek, n.p. (Czechoslovakia) 1964 pl-2. 3 DESCRIPTORS: (\*STORAGE BATTERIES, PERFORMANCE(ENGINEERING)), CZECHOSLOVAKIA, SILVER, SUPPLEMENTARY NOTE:

3 The basic parameters of silver zinc batteries made in Czechoslovakia are made with batteries made in other countries.

## UNCLASSIFIED

ZOMO2 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

HARRY DIAMOND LABS WASHINGTON D C

9 TM RESEARCH PROGRAM. HIGH-G TESTS COMPONENTS.

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Wilkin, Neil D. DESCRIPTIVE NOTE: Technical memo., JUL 65 24P Wilkin, N REPT. NO. TM-65-33 PROJ: DA1L013001A91A ,HDL A0200

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*TELEMETER SYSTEMS, ACCELEMATION), (\*ALKALINE BATTERIES, ACCELERATION), (\*DIODES, ACCELERATION), (\*DIODES, ACCELERATION), (\*ELECTRIC CONNECTORS, ACCELERATION), TELEMETERING), STORAGE BATTERIES, IMPACT SHOCK, PERFORMANCE (ENGINEERING), GRAVITY, STRAIN (MECHANICS), CADMIUM, SILVER, NICKEL, ELECTRIC INSULATION, VINYL PLASTICS
IDENTIFIERS: NICKEL-CADMIUM CELLS, SILVER CELLS SUPPLEMENTARY NOTE:

33

high acceleration. Tests were made to obtain data on the behavior of silver and nickel-cadmium cells, gas breakdown diodes, and associated equipment needed up 60.000 g and operate during an 8-min period after firing. The diodes and a high-frequency power transistor show survival capability without internal potting. The rate of failure of vinyl-covered that the cells can survive gun-launch accelerations Techniques are recommended for making further tests various telemetry components and subsystems under research to determine performance capabilities of in developing more efficient telemetry systems. Data obtained during lead-impact tests indicate electrical leads makes their use questionable. The report covers one portion of continuing of TM components and subsystems. (Author)

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AD- 622 405

AD- 622 423

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AIR FORCE AERO PROPULSION LAB WRIGHT-PATTERSON AFB AD- 621 080

3 INVESTIGATION OF SEMICONDUCTOR EQUALIZER DIODES FOR SECONDARY BATTERY CELLS,

Bishop, Wayne Scott; 25P

UNCLASSIFIED REPORT

PERFORMANCE (ENGINEERING), (\*SEMICONDUCTOR DIODES, BATTERY COMPONENTS), AVALANCHE DIODES, GERMANIUM, NICKEL, CADMIUM, BATTERY CHARGERS, PERFORMANCE (ENGINEERING), STORAGE BATTERIES, CONTROL, ( \* ALKALINE BATTERIES, SUPPLEMENTARY NOTE: DESCRIPTORS: (U)CONTROL

battery weights using the diode equalizer system are the diode technique are discussed and compared with other techniques of cell control. Projected this diode technique on a three cell sealed nickelis a high forward conductance germanium diode for overdischarge protection. Test data obtained using compared to similar ceils operating under the same conditions. The advantages and disadvantages of effects of these problems on premature battery failure are included. Techniques for circumventing these problems are outlined. A technique employing a zener diode for charge and overcharge control is presented in detail. Coupled with this zener diode cadmium battery is presented, and this data is results from overcharging and reverse charging performance is discussed. This cell unbalance (overdischarge) of individual cells. The Cell unbalance and its effect on battery discussed. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO? DDC REPORT BIBLIOGRAPHY

FEDERAL AVIATION ADMINISTRATION WASHINGTON D C SYSTEMS RESEARCH AND DEVELOPMENT SERVICE

3 FEASIBILITY OF RECHARGING FAA IN-SERVICE DRY CELL BATTERIES.

Corbin, Francis D. DESCRIPTIVE NOTE: Final rept., 21P AUG 65

NO. RD-65-86 450 102 06E REPT. NO.

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*DRY BATTERIES, MAINTENANCE), FEASIBILITY STUDIES, CARBON, ZINC, MANGANESE COMPOUNDS, DIOXIDES, STORAGE BATTERIES, ECONOMICS, ALKALINE BATTERIES, STORAGE, LIFE EXPECTANCY, MERCURY COMPOUNDS, OXIDES, NICKEL, CADMIUM, SILVER SUPPLEMENTARY NOTE: DESCRIPTORS: (\*DRY

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3 the presently used carbon-zinc batteries and also considers the use of other types which may have a better charge acceptance. It was found that, although the carbon-zinc battery is listed as being a primary sell, i.e., not rechargeable, it actually has a limited recharge capability provided the charging is done soon after discharge. Since most of our Inasmuch as capacity lost by selfdischarge cannot be replaced by charging, it is not recommended that a recharging program for carbon-zinc batteries be batteries are for emergency use, the loss of capacity these other types is so high that their use cannot be alkaline manganese dioxide-zinc batteries the cost of justified on an economic basis. Recommendations are made for the use of secondary manganese dioxideare better adapted for standby application, such as radiological equipment, and are more rechargeable The report explains the feasibility of recharging undertaken. A number of other types of batteries is due to self-discharge rather than actual use. than the carbon-zinc type. However, except for zinc batteries at some locations. (Author)

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 618 255 DEFENCE CHEMICAL BIOLOGICAL AND RADIATION LABS OTTAWA ONTARIO)

3 EFFECTS OF FOREIGN IONS ON NICKEL HYDROXIDE AND CADMIUM ELECTRODES.

Casey, E. J. ; Dubois, A. R. DESCRIPTIVE NOTE: Revised ed., . E. :Moroz.W. J.: 14P DCBRL-453 Lake, P

# UNCLASSIFIED REPORT

customers). Revision of manuscript submitted 11 Dec 61. Electrochemical Society v112 n4 p371-83 Apr 1965 (Copies not available to DDC or Clearinghouse SUPPLEMENTARY NOTE: Pub. in Journal of the

3 (\*ELECTRODES, IMPURITIES), (\*NICKEL COMPOUNDS, HYDROXIDES), (\*CADMIUM, FLECTRODES), NICKEL, ELECTROLYTES, POTASSIUM CUMPOUNDS, CARBONATES, CONTAMINATION, COMPLEX COMPOUNDS, NITRATES, OXIDATION, IONS, LITHIUM, SILVER, ANTIMONY, ALUMINUM, ARSENIC, DESCRIPTORS: (\*ALKALINE BATTERIES, ELECTRODES), DENTIFIERS: NICKL -CADMIUM CELLS, NICKEL

HYDROXIDE

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result of reduction of NO3(-) to NO2(-) at the cadmium electrode with subsequent reoxidation electrolyte, temperature, and current density was measured for both positive and regative electrodes. The effect of carbonate on the negative cadmium electrode is much greater than on the positive. The general mechanism and the role of intermediate complexes are discussed. Nitrate shuttle: Selfdischarge occurs ir. cells containing nitrate, as a electrodes of the sintered-plate nickel-cadmium battery system in the presence of foreign ions in The vahavior of individual positive and negative The variation of electrochemical capacity as a KOH solutions was examined. Carbonate choke: to NO3(-) at the nickel hydroxide electrode. Cations on the positive: Addition of Li(+), function of carbonate contamination of the Ag(+), Sb(+3), A1(+3),

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

TEN TIMES MORE POWERFUL THAN THE 'ROMASHKA',

3

Berezhnoi, Yu. 65-62628 MONITOR: TT , 65-65 JUL 65

UNCLASSIFIED REPORT

3 (\*ENERGY CONVERSION, THERMAL BATTERIES), SEMICONDUCTORS, THERMOCOUPLES, THERMOELECTRICITY, ELECTRIC POWER PRODUCTION, HEAT, USSR ( SUPPLEMENTARY NOTE: Unedited rough draft trans. from an unidentified 1964 or 1965 issue of Sovetskaya Rossiya DESCRIPTORS: (\*THERMAL BATTERIES, ENERGY CONVERSION)

Translation of Russian article: New developments in thermoelectrical generators.

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AD- 618 016

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

AD- 617 406

EAGLE-PICHER CO JOPLIN MO

ADVANCED DEVELOPMENT MODELS OF VENTED NICKEL-CADMIUM BATTERIES.

DESCRIPTIVE NOTE: Final rept. for 5 Apr 64-15 Mar MAR 65 20' Wilson, Jeff K.; CONTRACT: DA28 043AMC00065E

1C6 22001A053 PROJ:

UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, DESIGN), (\*STORAGE BATTERIES, DESIGN). NICKEL, CADMIUM, PHYSICAL PROPERTIES, BATTERY SEPARATORS, SPECIFICATIONS, PRODUCTION, TESTS
IDENTIFIERS: NICKEL-CADMIUM CELLS SUPPLEMENTARY NOTE: DESCRIPTORS: (\*ALK)

33

the production of forty (40) each BB-435/U, BB-437/U, BB-438/U and BB-439/U vented nickel-cadmium batteries. The work was directed toward the attainment of a new line of nickel-cadmium batteries in accordance with the Signal Corps Technical Requirements SCL-6867B. (Author) Development and production work was directed toward

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 617 275 HARRY DIAMOND LABS WASHINGTON D C

3 ELECTRONIC TIME-FUZE POWER SUPPLIES FOR ARTILLERY SHELLS,

Davis, Benjamin L. ; Scillian 29P 65 Glenn L. MAY

REPT. NO. TR-1288 PROJ: DA1X5427090369 ,45894

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*POWER SUPPLIES, BATTERY COMPONENTS), (\*BATTERY COMPONENTS, TIME DELAY FUZES), (\*TIME DELAY FUZES, POWER SUPPLIES), PROJECTILES, STORAGE BATTERIES, PRIMARY BATTERIES, THERMAL BATTERIES, LIFE EXPECTANCY, STORAGE, MILITARY REQUIREMENTS, FEASIBILITY STUDIES, DRY BATTERIES, ELECTROLYTES, EFFECTIVENESS, AMMONIA, METALS, DENTIFIERS: ARTILLERY SHELLS, RESERVE BATTERIES SUPPLEMENTARY NOTE: (U)METALS

suitable for providing power to artillery-shell time fuzes. The evaluation was based upon the energy density, operability over the required military temperature range, and storability. The major problems to be solved include operation over the temperature range of -65 to + 165F, a shelf life of at least 10 yr, fast activation, and small size. A program is recommended that should lead to the successful development of one or more power-supply A study was made of the electrochemical systems designs for this application. (Author)

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ZOM02 SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

615 114

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

3 A PRELIMINARY STUDY OF FACTORS AFFECTING MAGNESIUM DRY CELL PERFORMANCE CHARACTERISTICS,

65 23P ECOM-2561

Wood, Donald B.

1C6 22001A053 REPT.

1C6 22001A053 02 FASK:

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*DRY BATTERIES, PERFORMANCE (ENGINEERING)), (\*PRIMARY BATTERIES, PERFORMANCE (ENGINEERING)), MAGNESIUM, ELECTROLYTES, MAGNESIUM COMPOUNDS, PERCHLORATES, CHLORIDES, BROMIDES, LITHIUM COMPOUNDS, ANODES (ELECTROLYTIC CELL), COATINGS, MAGNESIUM ALLOYS, ALUMINUM ALLOYS, ZINC ALLOYS, RADIO EQUIPMENT, POWER SUPPLIES

IDENTIFIERS: AN/PRT-4, ITHIUM CHLORIDE, MAGNESIUM BROMIDE, MAGNESIUM CHLORIDE, MAGNESIUM

chromate ion were found to be beneficial in reducing the delayed action characteristic of the magnesium cell, but had a deleterious influence on the determine the cell parameters that influence the delayed action' of 'N' size magnesium dry cells when subjected to the duty cycle and drain rate encountered in the AN/PRI-4 radio set. High concentrations (5N) of magnesium perchlorate electrolyte, protective films such as Cramolin, applied to the anode, and low concentrations of Preliminary investigations were carried out to

3 electrolytes resulted in cells that performed better capacity were considered. There is little difference between cells made with AZ10 alloy cans service capacity of the cell. Cells incorporating more active electrolytes such as MgC12, LiCl electrolyte when both delayed action and service and AZ21 cans with regard to service and delayed than cells incorporating magnesium perchlorate and MgBr2 and various mixed perchlorates and mixed bromides were evaluated. None of these action characteristics. (Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 614 471

MELPAR INC FALLS CHURCH VA

A THIN-PLATE BATTERY. SUPPLEMENT TO THINFILM MONOTRONICS

3

DESCRIPTIVE NOTE: Final rept., suppl., 12 Mar 64-12 Mar 65.

Smit, J. 65 MAR

CONTRACT: NOW-64-0568 PROJ: AF-6694

64-560 AFCRL MONITOR:

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-607 029.
DESCRIPTORS: (\*BATTERIES AND COMPONENTS, PRIMARY BATTERIES), (\*POWER SUPPLIES, PRIMARY BATTERIES), PEFORMANCE (ENGINEERING), WET CELLS, AMMONIA, ELECTROLYTES, SALTS, ANHYDRIDES, COMPATIBILITY, ALUMINUM, POLYMERS, CONTAINERS, ELECTRODES, ELECTROCHEMISTRY IDENTIFIERS: AMMONIA-ACTIVATED BATTERIES

33

storage is needed. Another engineering difficulty is designing a lightweight case capable of containing producing a high power output liquid ammoniated activated battery. Experimental results show the capability of the system to operate at both high and low current densities and through a wide range of temperatures. In addition it has been demonstrated to a reasonable extent that the data generated in small units can be gainfully extrapolated to the construction of larger units capable of producing however, some materials and engineering problems yet to be solved before a practical high power output unit can be produced. Specifically, there exists a need for a battery plate compartment liner material that is chemically resistant and easy to handle. Also, a reservoir compartment liner compatible with Data obtained thus far point to the feasibility of solution or the drive gas pressure necessitates case structure of unreasonable size and weight. equilibrium vapor pressure of the electrolytic the electrolytic solution over long periods of discharge. Any increase in pressure over the internal pressures generated during battery power outputs up to 75 watts. There remain

AD- 614 471

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AD- 615 114

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ARMY ELECTRONICS COMMAND FORT MONMOUTH N J AD- 614 104

3 PERFORMANCE OF SINTERED PLATE NICKELCADMIUM CELLS, THE EFFECT OF CARBONATED ELECTROLYTE ON THE

Rappaport, Paul J. ; ECOM-2559 1C014501A34A REPT. NO. PROJ:

TASK: 1C014501A34A00,1C014501A34A02

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:
DESCRIPTORS: (\*ALKALINE BATTERIES, PERFORMANCE
(ENGINEERING)), (\*ELECTROLYTES, CARBONATES),
(\*CARBONATES, ALKALINE BATTERIES), POTASSIUM COMPOUNDS,
HYDROXIDES, RESISTANCE (ELECTRICAL), ELECTRODES, NICKEL, CADMIUM

3 IDENTIFIERS: NICKEL-CADMIUM CELLS, POTASSIUM CARBONATE, POTASSIUM HYDROXIDE

adverse effect on the performance of cells when the results of the capacity and specific resistance measurements, it is recommended that the maximum allowable carbonate content for the electrolyte in 40F. There was no marked difference in performance carbonate content was 238 g/1 K2CO3, particularly for the negative capacity limiting cells. From the of either positive or negative capacity limiting cells with electrolyte containing 24 or 71 g/1 of were investigated. Data are also presented on the solutions over the temperature range of 86F. to negative limiting sintered plate Ni-Cd cells of varying the KOH/ K2CO3 ratio of an electrolyte which is approximately 7N in total alkalinity is reported. K2CO3 contents of 24, 71 and 238 g/1 The effect on the capacities of positive and sintered plate Ni-Cd cells be set at 100 g/1 K2CO3. However, there was an appreciable specific resistance of various KOH-K2CO3 K2CO3. (Author)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 612 492

GULTON INDUSTRIES INC METUCHEN N J

LITHIUM-NICKEL HALIDE SECONDARY BATTERY INVESTIGATION.

DESCRIPTIVE NOTE: Final technical rept. Dec 63 - Dec

3

Lyall, A. ; Seiger, H. N. NAD

Shair, R. C. ; CONTRACT: AF 33(615)-1266

PROJ: AF-8173 TASK: 817304

AFAPL MONITOR: UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS:

DESCRIPTORS: (\*STORAGE BATTERIES, PREPARATION), (\*ELECTRODES, ELECTROCHEMISTRY), (\*ELECTROLYTES, COMPATIBILITY), LITHIUM COMPOUNDS, NICKEL COMPOUNDS, HALIDES, CHLORIDES, FLUORIDES, ELECTROLYTIC CELLS, ALKENES, CARBONATES, ALUMINUM COMPOUNDS, ELECTRICAL CONDUCTIVITY, CHLORINATION, BINDERS, METHYL CELLULOSE,

3 IDENTIFIERS: ALUMINUM COMPOUNDS, CHLORIDES, LITHIUM CHLORIDE, NICKEL(II) CHLORIDE, PROPYLENE CARBONATE

BATTERY SEPARATORS

processes, the electrolyte, and cell components of the nickel chloride-lithium cell. Compatability test results are discussed and recommendations for cell components made. Electrolytes, based on the compatability tests, were made and evaluated. A The report encompasses a study of the electrode

nickel chloride electrodes were prepared which yield satisfactory lithium electrode was prepared by pasting an oil mixture of powdered lithium, carbonyl nickel and a carboxymethylcellulose binder on an chlorinated and the excess chlorine scavenged with associated with the nickel chloride electrode. A major modification to the propylere carbonate - AlCl3 electrolyte was made. The electrolyte is materials were found for the chloride system. Through the technique of 'formation cycling', lithium metal. This modification has greatly expanded nickel screen. Three good separator reduced the kinetic polarization originally

3

80% utilization of the theoretical capacity.

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SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

LITHIUM-SILVER-CHLORIDE SECONDARY BATTERY INVESTIGATION

3

DESCRIPTIVE NOTE: Final rept. Dec 63 - Nov 64, FEB 65 1091 Chilton, J. E., Jr.; Conner,

FEB 65 109: Chilton, J. E. W. J.; Cook, G. M.; Holsinger, R. W.; CONTRACT: AF 33(615)-1195

PROJ: AF-8173

MONITOR: AFAPL

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), (\*LITHIUM COMPOUNDS, CHLORIDES), (\*SILVER COMPOUNDS, CHLORIDES), (ECTROLYTES, BATTERIES AND COMPONENTS, ELECTRIC CONNECTORS, SEALS (STOPPERS), HALOCARBON PLASTICS, ALUMINUM, ALKENES, LITHIUM, ELECTRODEPOSITION, ELECTRODES, THERMOCHEMISTRY, POLYETHYLENE PLASTICS (IDENTIFIERS: ALUMINUM COMPOUNDS, CHLORIDES, LITHIUM CHLORIDE, PROPYLENE, SILVER CHLORIDE SUPPLEMENTARY NOTE:

3 3

electrodes sealed in a polyethylene case which had an energy density of 88 watt-hr/lb at 0.22 ma/sq cm within experimental acturacy equal to the theoretical values calculated for the following cell reaction prepared using an improved seal assembly technique. Propylene carbonate electrolyte conductivity may be increased by the addition of solvents such as ether with cell reactants and products in solid state: Li electrodes have been prepared by pasting a mix of 75% AgCl and 90% AgCl with 10% acetylene black. Cell heat measurements yield thermodynamic values for the postulated cell reaction of free and toluene. The electrodeposition of propylene lithium from 50 vol % solutions of these solvents chloridenonaqueous electrolyte cell system were energy, heat of reaction, and entropy which are Aluminum cases for housing the lithium-silver chloride cell cycle life is improved at high with propylene carbonate LiCl and AICl3 occurs at high efficiency. Silver chloride temperature. A cell was constructed with + AgCl yields LiCl + Ag. Lithium-silver current density.

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AD- 610 563

CALVIN COLL GRAND RAPIDS MICH

3 SILVER MIGRATION AND TRAMSPORT MECHANISM STUDIES IN SILVER OXIDE-ZINC BATTERIES.

DESCRIPTIVE NOTE: Final rept., ASP Dirkse,T. P.

DEC 64 65P D

PROJ: AF-8173 TASK: 817304

TR-64-144 AFAPL MONITOR:

# UNCLASSIFIED REPORT

BATTERIES), (\*ALKALINE BATTERIES, ELECTROCHEMISTRY), (\*TRANSPORT PROPERTIES, ALKALINE BATTERIES), SURFACE ACTIVE SUBSTANCES, DIFFUSION, SILVER COMPOUNDS, OXIDES, ZINC, ELECTRODES, ELECTROLYTES, ZINC COMPOUNDS, HYDROXIDES, POTASSIUM COMPOUNDS, DECOMPOSITION, LIFE EXPECTANCY, BATTERY SEPARATORS, SOLUTIONS(MIXTURES), PERFORMANCE (ENGINEERING), PALLADIUM, ALUMINUM, DESCRIPTORS: (\*BATTERIES AND COMPONENTS, ALKALINE SUPPLEMENTARY NOTE: CELLULOSIC RESINS

3

related to the deposition of silver on the separators Methods for testing the ability of separator materials to allow the diffusion of dissolved silver oxides, zincate ions, and hydroxide ions, have been oxide in aqueous KOH were studied, particularly the effect of solid materials, some ions, and separator diffusion rates obtained by these methods. The results have also been studied to determine the applicability of Fick's first law of diffusion to materials. A possible mechanism for these effects these processes. The use of surfactants in the electrolyte and in the zinc electrodes has been studied. The effect of these substances on cycle life and on various zinc electrode processes was checked to determine the reproducibility of the measured. The greatest effects noted were those associated with the zinc electrode processes. Various aspects of the decomposition of silver is given. This decomposition is very closely in silver-alkaline batteries. (Author)

AD- 610 563

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AD- 612 189

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ZOMO2

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

THE NEW NICKEL-ZINC STORAGE BATTERY

3

Zhulidov, N. A. ; Efremov, F. I.; 65 60976 JAN 65 8P REPT. NO. FID-II-64-605 MONITOR: IT, 65 6

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Novyi Nikel'-Tsinkovyi Akkumulyator, unedited rough draft trans. of Vestnik Elektropromyshlennosti (USSR) 1963, v. 34, no. 2, p. 74-

3 DESCRIPTORS: (\*STGRAGE BATTERIES, REVIEWS), ZINC, NICKEL, ALKALINE BATTERIES, CONSTRUCTION, PERFORMANCE (ENGINEERING), USSR

3 review is given of the construction and operating characteristics of Sov et-built Ni-Zn

## UNCLASSIFIED

SEARCH CONTROL ND. DOC REPORT BIBLIDGRAPHY

AD- 610 010

ARMY ELECTRONICS LABS FORT MONMOUTH N J

STANDARD LINE ALKALINE SECONDARY BATTERIES

3

Settembre, Erminio J. Technical rept., 25P DESCRIPTIVE NOTE:

JUL 64 25P PROJ: 1C6 22001A053 TASK: 1C6 22001A053 02

2527 ECOM . MONITOR:

# UNCLASSIFIED REPORT

BATTERIES, STORAGE BATTERIES), STANDARDIZATION, ELECTRODES, NICKEL, CADMIUM, SILVER, SILVER COMPOUNDS, OXIDES, ZINC, CONTAINERS, GLASS TEXTILES, PLASTICS, ELECTRIC CONNECTORS, BATTERIES AND COMPONENTS SUPPLEMENTARY NOTE:
DESCRIPTORS: (\*STORAGE BATTERIES, DESIGN), (\*ALKALINE

3

3 The development of a family of secondary batteries based on the design of only 18 sizes of battery boxes will make available for field use 108 units to to be derived from such a family of batteries will be enhanced further by incorporating in the design capability for operation of one-third of these batteries at 24 or 12 volts and one-third at 12 or 6 volts. The cases will be designed of fiberglas reinforced plastic to withstand severe environmental two of the vented nickel-cadmium batteries are under nickel-cadmium, the zinc-silver oxide, and the cadmium-silver oxide) and will be made up of vented conditions and to provide operation with or without provide 6-, 12and 24-volt operation in capacities from 3.5 to 220 ampere hours. These 108 units will be built in three electrochemical systems (the covers. With the covers removed, coupling directly to using equipment will be possible. or sealed cells which will have been standardized previously. The flexibility and interchangeability cadmium cells is being accomplished at present and Standardization of nickel-cadmium and silverdevelopment. (Author)

SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

AD-

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

3 A STUDY OF FACTORS AFFECTING THE CORROSION RATE OF MAGNESIUM IN VARIOUS ELECTROLYTES UNDER STATIC CONDITIONS.

Nordell, Carl A. 2517 TASK: 1AO 13001A039 19 178 MONITOR: ECOM AUG 64

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, MAGNESIUM),
(\*MAGNESIUM, CORROSION); (\*CORROSION INHIBITION,
MAGNESIUM), (\*ELETROLYTES, CORROSION), MAGNESIUM
ALLOYS, MAGNESIUM COMPOUNDS, CHLORIDES, BROMIDES,
PERCHLORATES, SALTS, SOLUTIONS(MIXTURES), FATTY ACIDS,
SILICON COATINGS, FILMS, CHEMICAL PROPERTIES, SURFACE, SUPPLEMENTARY NOTE:

The corrosion rates of magnesium and magnesium alloys in magnesium salt solutions of chloride, bromide, and perchlorate were studied by measuring the gaseous reaction product as a function of time. static corrosion rates. Cramolin, one of the films tested, reduced the gas evolution of an AZ21 Mgdetermine the volumes of gas generated. Protective meta: to suppress excessive chemical reactivity at films were applied to the surface of the magnesium the metal-electrolyte interface, thereby reducing Reliable apparatus was developed to accurately 2N MgBr2 system from 400 cc/800 hrs to 0.1 cc/ 800 hrs. (Author)

3

## UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

CALVIN COLL GRAND RAPIDS MICH AD- 609 876

LOW TEMPERATURE CYCLING BEHAVIOR OF THE SILVER

ELECTRODE.

3

ical rept. no. 3, Dirkse, Thedford P. DESCRIPTIVE NOTE: Technical rept. no. NOV 64 13P CONTRACT: Nonr168202 PROJ: NR359 364

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, ELECTRODES), (\*ELECTRODES, LOW TEMPERATURE), (\*SILVER, ELECTRODES), BATTERIES AND COMPONENTS, CADMIUM, ELECTRICAL PROPERTIES, FAILURE (MECHANICS), TEST METHODS, SUPPLEMENTARY NOTE:

IDENTIFIERS: SILVER-CADMIUM CELLS ELECTROCHEMISTRY

33

silver electrode was carried out. (see AD-404 841). Emphasis was placed on the performance of the silver electrode at temperatures below freezing and the effect of current density on these Further work on the cycling characteristics of the characteristics. (Author)

3

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PAGE

AD- 609 988

#### 313

## UNCLASSIFIED

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

BURGESS BATTERY CO FREEPORT ILL AD- 606 879

BATTERY, DRY, VEST TYPE BA-398( )/PRC-25.

DESCRIPTIVE NOTE: Rept. no. 1 (Final) 1 Jul 63-30 TASK: 1C6 22001A053 02

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

3 DESCRIPTORS: (\*PRIMARY BATTERIES, PORTABLE EQUIPMENT), (\*BATTERIES AND COMPONENTS, PORTABLE EQUIPMENT), ZINC, MANGANESE, DIOXIDES, ELECTRIC CABLES, MANUFACTURING,

IDENTIFIERS: MANGANESE(IV) OXIDE

3

3 could be made with current production equipment, the purpose being that this would insure production methods and practices necessary for a smooth complements was accomplished by using electrolytic manganese dioxide and Burgess Spun Paste the cell and cell blocks were planned so that they Cells. Production of the batteries was accomplished without any problems. The design of The feasibility of BA-398 ( )/PRC-25 vest battery was investigated. The design of battery operation. (Author)

## UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

MALLORY BATTERY CO TARRYTOWN N Y AD- 603 581

TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND

BATTERIES

3

3

DESCRIPTIVE NOTE: Semi annual rept. no. 7, 31 Jul 63-31 Jan 64,

Goodman, Roger ; CONTRACT: DA

CONTRACT: DA36 039sc78320 TASK: 1G6 22001A053 02

# UNCLASSIFIED REPORT

3 SUPPLEMENTARY NOTE:
DESCRIPTORS: (\*ALKALINE BATTERIES, ELECTRIC DISCHARGES),
(\*BATTERIES AND COMPONENTS, ALKALINE BATTERIES),
(\*STORAGE BATTERIES, ALKALINE BATTERIES), DRY BATTERIES,
PRIMARY BATTERIES, ZINC, MERCURY COMPOUNDS, OXIDES,
TEMPERATURE, TABLES(DATA), TESTS, STORAGE, VOLTAGE

3 The testing and evaluation of primary alkaline cells and batteries of the zinc-alkaline-mercuric oxide system is discussed. Delayed discharge test results are presented for cell types 1R at 18 months, 12R at 36 months, 42R at 18 months, 65R at 6 months, 1438R at 12 months, and 1456R at 18 months. Partial data is presented on discharge of cell type 42R at the 1000-hour rate after 36 months of storage. Monthly EMF readings were taken on the seven cell types remaining in the program.

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

AD- 602 676

INLAND TESTING LABS DAYTON OHIO

ALKALINE BATTERY EVALUATION.

3

DESCRIPTIVE NOTE: Final rept. 30 Jun 60-15 Mar 64, JUN 64 542P Clark, W. W. :Ingling, W. G. Luke, I. F. :Roeger, E. A. , Jr.: CONTRACT: AF 33(616)-7529

PROJ: AF-8173 TASK: 817304

MONITOR: AFAPL TDR-64-76

# UNCLASSIFIED REPORT

ASD TDR63 394, PI: AD-411 245; ASD TDR62 893 PI; AD-291 447; ASD TDR62 553; AD-278 647, ASD TDR62 68; AD-273 688; asd tr61 236; AD-276 051; N63-10422; N64-12325, N64-14962.

DESCRIPTORS: (\*BATTERIES AND COMPONENTS, ALKALINE BATTERIES), (\*ALKALINE "ATTERIES, SPACECRAFT), (\*STORAGE BATTERIES, PERFORMANCE (ENGINEERING)), NICKEL, CADMIUM, SILVER, ZINC, FAILURE (MECHANICS), ENVIRONMENTAL TESTS, TEMPERATURE, LIFE EXPECTANCY, TESTS, ELECTROLYTIC CELLS, EXPERIMENTAL DATA, VOLTAGE, ELECTRIC CURRENTS (U) Supersedes RTD TDR63 4144, P1; SUPPLEMENTARY NOTE:

3 20 cells, and 150 20 ampere-hour nickel-cadmium cells in groups of 10 cells. The 12 ampere-hour cells were cycled in four temperature environments with four depths of discharge in each environment while the 20 ampere-hour cells were cycled in five temperature environments with three depths of discharge in each environment. Also included in this report are the results of cycle-life performance cadmium cells in groups of 10 cells and batteries of life performance tests on 240 12 ampere-hour nickelperformance tests on these four types of cells show with three depths of discharge in each environment. separated into eight cell groups. Both types of cells were cycled in four temperature environments tests conducted on 192 25 ampere-hour silver-zinc cells and 192 20 amperehour silver-cadmium cells that: (1) cell cycle-life with shallow discharges This report includes the final results of cycleis considerably longer than cycle-life at deep discharges and (2) cyclelife is reduced by high The results obtained from the cycle-life and low ambient temperatures. (Author)

AD- 602 676

UNCLASSIFIED

SEARCH CONTROL NO. DUC REPORT BIBLIOGRAPHY

.- 489 830 10/3 GULTON INDUSTRIES INC METUCHEN N J ALKALINE BATTERY

INVESTIGATION OF HERMETICALLY SEALED, HIGH RATE, MAINTENANCE-FREE, NICKEL-CADMIUM BATTERIES FOR AIRCRAFT APPLICATIONS.

3

DESCRIPTIVE NOTE: Final technical rept. Jul 64-Jun 66, SEP 66 125P Kantner, Edward ; Tarantino, Robert ; Ritterman, Paul ; Shair, Robert ;

REPT. NO. AB-8590F CONTRACT: AF 33(615)-2087

PROJ: AF-8173 TASK: 817304

MONITOR: AFAPL TR-66-77

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*NICKEL, \*CADMIUM), (\*STORAGE BATTERIES, \*AIRCRAFT), ELECTRODES, POLARIZATION, ACETATES, SALTS, ELECTRIC DISCHARGES, THERMAL ANALYSIS, TEMPERATURE, THICKNESS, VOLTAGE, IMPURITIES, ENVIRONMENTAL TESTS, HERMETIC SEALS, MAINTENANCE, GEOMETRIC FORMS, ELECTROCHEMISTRY, NITRATES, CHLORIDES

Theoretical and experimental investigations were

carried out to improve the high rate charge-discharge characteristics of sealed, nickel-cadmium batteries. These investigations showed that the use of thinner battery plates greatly improved high rate electrical performance. Laboratory prototype cells were fabricated and tested at rates up to 100 on charge

evolved in increasingly greater quantities as the temperature dropped. High rate charge efficiency from -30 F to +140 F varied with temperature. and 17C on discharge from -30 F to +140 F.
Cell voltages after one minute of discharge at 17C, ranged from 0.45 V at -30 F to above 0.8 V at +140 F. These tests also indicated that the cells could be fully charged in five minutes. However, at temperatures below 20 F hydrogen was

battery charging, were investigated. The inverter phase control, SCR phase control, and parallel chopper were studied as a means to condition the aircraft bus to the optimum requirements of the battery. (Author) pressure switch, as a means to control nigh rate The Adhydrode, Cd/Cd(OH)2 coulometer and

AD- 489 830

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PAGE

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### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

LEESONA MOOS LABS DIV LEESONA CORP GREAT NECK N Y 10/3 AD- 484 265

3 HIGH RATE (5 MINUTE) MISSILE BATTERY PROGRAM.

Vertes ,M. A. ;Oxley ,J. E. DESCRIPTIVE NOTE: Final rept. 15 Jun 65-18 Mar 66 66 110P

CONTRACT: AF 33(615)-2680 : Cohen, S. :

PROJ: AF-8173 TASK: 817304

TR-66-50 AFAPL MONITOR:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*GUIDED MISSILE BATTERIES, ELECTRICAL PROPERTIES), DESIGN, ALUMINUM, OXYGEN, ZINC, VOLTAGE, CORROSION, WEIGHT, ELECTRIC DISCHARGES, ELECTROLYTES, THERMAL PROPERTIES, POLARIZATION, MICROSTRUCTURE, ANODES(ELECTROLYTIC CELL), CATHODES(ELECTROLYTIC CELL(U)) IDENTIFIERS: CURRENT DENSITY (U)

3 contributing factors and their relative contributions improvement, however, could not be achieved with a concurrent increase in hydrogen overvoltage. The high rate of corrosion accompanying the increased hydrogen evolution prevents the use of these alloys in batteries. A parallel study indicate that heat The findings of an investigation of the aluminum/oxygen battery system in the 0.25 - 5 min discharge time range are presented. Considerable improvement is eliminated. Estimates of the battery weights at the various discharge rates were optimized using a in the electrochemical reversibility of Al anodes was found in the Al-Sn alloys. This sinks would be required to absorb the waste heat generated during discharge - even if H2 evolution towards total system weight. It is concluded that greater effect on overall battery weight than the efficiency and cell operating voltage have a much computer program. It was shown that neither A1/ 02 or Zn/O2 are capable of meeting the 100 the high rates couple reversibility, thermal watt-hr/1b goal at the 5-min rate. A general discussion is included identifying the weight theoretical energy density. (Author)

## UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

BATTERY CORP OF AMERICA FORT LAUDERDALE FLA 10/3 AD- 482 644

LOW TEMPERATURE BATTERY (NEW MAGNESIUM ANODE

STRUCTURE).

3

DESCRIPTIVE NOTE: Final rept. 1 Oct 62-31 Oct 65, Balaguer, Rodolfo R. ; 194P 99 REPT. NO. MAY

DA-36-039-AMC-00021(E) ,DA-36-039-AMC-CONTRACT:

03369(E)

PROJ: DA-1C6-22001-A-053 TASK: 1C6-22001-A-053-02

MONITOR: ECOM 03369-F

# UNCLASSIFIED REPORT

3 3 STUDIES), ANODES, MAGNESIUM, BATTERY SEPARATORS, DEGRADATION, DESIGN, STORAGE, LIFE EXPECTANCY, LEAKAGE(FLUID), ELECTROLYTES, MAGNESIUM COMPOUNDS, BARIUM COMPOUNDS, MANGANESE COMPOUNDS, DIOXIDES, CHROMATES, BROMIDES, SODIUM COMPOUNDS, STRONTIUM COMPOUNDS, HYDROXIDES, CARBON BLACK, PRIMARY BATTERIES, (\*LOW TEMPERATURE BATTERIES, FEASIBILITY IDENTIFIERS: BARIUM CHROMATE, MAGNESIUM HYDROXIDE MAGNESIUM BROMIDE, MANGANESE(IV) OXIDE, SODIUM CHROMATE, STRONTIUM BROMIDE DRY BATTERIES DESCRIPTORS:

developed which prevents electrolyte leakage from the the rope tack masking tape improved the shelf life of contamination, which had caused serious shelf life problems, was accomplished by modifications in the method of forming the cup. A plastic closure was cell to a high degree and virtually eliminated problem of cell expansion during discharge. Different separators, reinforcements and closures were tested. Investigations of shelf life, cell reproducibility and low temperature performance consisted of 18 programs involving various design modifications and combinations of cell components. cell. A seamless steel jacket in combination eith minimized the pitting. The elimination of copper investigate the anode potting of the cell. Cleaning of the anode after forming with Dow 21 Eight screening programs were undertaken to The physical parameters of the 'D' size Balaguer cell structure were evaluated.

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

MALLORY (P R) AND CO INC BURLINGTON MASS LAB FOR PHYSICAL SCIENCE

CELL EQUALIZATION TECHNIQUES.

3

DESCRIPTIVE NOTE: Final technical rept. Feb 65-Feb 66.
APR 66 182F Amsterdam , Richard ; Ball,

AF 33(615)-2491

TR-66-23 TASK: £17304-18 MONITOR: AFAPL

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, STABILITY), NICKEL, CADMIUM, SILVER, HEAT SINKS, DIODES, DESIGN, VOLTAGE, ELECTRIC DISCHARGES, ELECTRIC CURRENTS, LEAKAGE(ELECTRICAL), TEMPERATURE, VACUUM, TRANSISTORS, THERMAL ANALYSIS, TEST EQUIPMENT, PERFORMANCE (ENGINEERING), FATIGUE (MECHANICS), CONTROL

IDENTIFIERS: STABISTORS

3 conduction type heat sink was designed and applied to operation of a stabistor/cell combination showed that the stabistor tends to compensate, to a large extent, accomplished by means of a stabistor constructed of forward-biased diodes which, through the use of careful heat sink design bypasses most of the charge current around a cell when it becomes charged. A the fabrication of cells of 6, 12 and 20 AH capacity designed to meet a cycle of 35 minutes, 75 percent discharge followed by 55 minutes charge over a range of -10 C and 50 C. It was demonstrated that a battery of secondary cells with stabistor found to have excessive forward leakage, causing rapid discharge of cells. A reed switch Circuit was found satisfactory, but limited in current. Tests demonstrated that the Voltage characteristic increasing temperature. Low-energy gap diodes and transistor circuits for reversal protection were charge control can be subjected to C/1 charge for for the decrease in ce'l charging efficiency with effects of changes in ambient temperature on the 30 days without harmful effects. Studies of the of a charging silver-cadmium cell causes proper Charge control of nickel-cadmium cells was operation of the stabistor.

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF MATERIALS SCIENCES LAB 10/3 AD- 481 543

LITHIUM-ANODE LIMITED CYCLE BATTERY

INVESTIGATION.

Bauman , H. F. ; Chilton , J. DESCRIPTIVE NOTE: Annual rept. Feb-Dec 65, APR 66 E. ; Mauri, R.

CONTRACT: AF 33(615)-2455 TASK: 817304

TR-66-35 MONITOR: AFAPL

UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, \*ELECTROCHEMISTRY),
LITHIUM, ANODES, COPPER COMPOUNDS, COBALT COMPOUNDS,
ORGANIC SOLVENTS, LACTONES, BUTANES, PROPANOLS, ESTERS,
CARBONATES, AMMONIUM COMPOUNDS, PROSPHORUS COMPOUNDS,
SODIUM COMPOUNDS, LITHIUM COMPOUNDS, PERCHLORATES,
ELECTROLYTES, ELECTRIC DISCHARGES, VOLTAGE, ELECTRICAL
RESISTANCE, BATTERY SEPARATORS, EFFECTIVENESS, ELECTRIC
CURRENTS, COMPATIBILITY, CATHODES, REDUCTION (CHEMISTRY),
POLAROGRAPHIC ANALYSIS, KETONES BUTYROLACTONE, COBALT(III) FLUORIDE, COPPER(II) FLUORÎDE, LITHIUM PERCHLORATE, PROPYLENE CARBONATE, SODIUM HEXAFLUOROPHOSPHATE IDENTIFIERS: AMMONIUM HEXAFLUOROPHOSPHATE,

3

This program, to develop batteries based on the lithium-cupric fluoride and lithium-cobaltic fluoride Couples, was concerned with the development of Solvents studied and the majority of effort was with reasonable stability and were moderately successful as electrolyte for cell tests. Solutions of Lic104 in propylene carbonate gave by far the best discharges. Lithium anodes were prepared from results on cell test. The selection of either type these solvents. Conductivities were measured with or use in batteries will depend upon fabrication components as well as battery design. Propylene carbonate and butyrolactone were the most stable several fluorine complex salts in butyrolactone. simplicity. Resistance, electrolyte absorption, lithium strip and despersions and gave similar Solutions of NH4PF6 in propylene carbonate and Solutions of NaPF6 in propylene carbonate had

AD- 481 543

3

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 478 674 10/3 7/4 CALVIN COLL GRAND RAPIDS MICH INVESTIGATION OF THE TRANSPORT AND REACTION PROCESSES OCCURRING WITHIN SILVER OXIDE-ZINC BATTERIES. (U)

DESCRIPTIVE NOTE: Final rept.,
MAR 66 53P Dirkse,Thedford P.
CONTRACT: AF 33(615)-2297
MONITOR: AFAPL TR-66-5

UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, ELECTROCHEMISTRY), (\*ALKALINE BATTERIES, ELECTROCHEMISTRY), (\*ELECTRODES, ELECTROCHEMISTRY), (\*ELECTRODES, ELECTROCHEMISTRY), ZINC, SILVER COMPOUNDS, OXIDES, POTASSIUM COMPOUNDS, HYDROXIDES, ELECTROLYTES, CATHODES(ELECTROLYTIC CELL), DECOMPOSITION, VOLTAGE, SURFACE ACTIVE SUBSTANCES, ADDITIVES, TEMPERATURE, CONTAMINATION, SOLUBILITY, (U)

The decomposition of Ag2D dissolved in KOH solutions was studied; effects of temperature, light, KOH concentration, Ag2D concentration, and additives on this decomposition were measured. At least two mechanisms are involved but the precise nature of these mechanisms is still unknown. Overvoltages for anodic and cathodic zinc electrode processes were measured by different methods. The presence of additives in the electrolyte had little effect on these overvoltages but overvoltages were markedly affected by KOH concentration and temperature. Amalgamation improved performance of the Zn electrode but this effect decreased with decreasing temperature. Ag contamination adversely affected cathodic Zn electrode processes. It appears that the beneficial effects of additives to the electrolyte are related to the presence of carboxyl groups and that the beneficial effects of additives to the Zn electrode are related to their wetting ability. (Author)

### UNCLASSIFIED

COC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 476 224 10/3 NAVAL APPLIED SCIENCE LAB BROOKLYN N Y POSITIVE PLATE SULFATION CHARACTERISTICS OF THE LEAD— (U)

DESCRIPTIVE NOTE: Final rept.,
DEC 65 31P Tudor, S. ; Weisstuch, A.

Davang.S. H.; REPT. NO. NASL-9400-35-F PROJ: SF013-06-03

TASK: 4366

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, \*SULFATION),
(\*ANODES(ELECTROLYTIC CELL), SULFATION), BATTERY
COMPONENTS, ELECTRIC BATTERIES, CAPACITANCE,
LEAD(METAL), CALCIUM, ELECTRODES, ADDITIVES, PHOSPHORIC
ACIDS, THICKNESS, RADIOGRAPHY, SUBMARINES,
ELECTROCHEMISTRY
(U)

Sulfation patterns in charged positives of thick and thin-plate lead-calcium grid cells, with and without H3P04 additive, were determined autoradiographically. A mechanism is proposed to explain capacity maintenance behavior of these cells. Thickness and density of positive active material was more important for capacity maintenance than grid thickness or surface area. Improved thin-plate lead-calcium grid cells were developed utilizing:

(1) H3P04 incorporated in the positive paste mix for extended service life, and (2) a double-layer positive paste structure for improved capacity maintenance without sacrifice of the high discharge (U)

ZOM02 SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

- 466 991 COAST GUARD BALTIMORE MD FIELD TESTING AND DEVELOPMENT CENTER

EFFECT OF STORAGE ON PERFORMANCE OF CARBONE 12-AN-10 POWER UNITS.

wesler, J. E. ; Test JUL 65 15P REPT. NO. 422 PROJ: CGTD J16 1 2 6a DESCRIPTIVE NOTE:

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, STORAGE), (\*BATTERY COMPONENTS, NAVIGATION LIGHTS), BUOYS, TESTS, RELIABILITY(ELECTRONICS), BEACON LIGHTS, TEST METHODS, ELECTRIC DISCHARGES, LIFE EXPECTANCY, ELECTRIC CURRENTS, COAST GUARD, (U)COAST GUARD SUPPLEMENTARY NOTE:

navigation buoys. Tests were conducted to determine the effect of initial storage and storage after partial discharge of these primary batteries. the standard power supply for use in aids to The United Stages Coast Guard is currently adopting the CARBONE 12-AN-10 Power Unit as (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

JOHNS HOPKINS UNIV SILVER SPRING MD APPLIED PHYSICS AD- 466 360

3 DESIGN AND OPERATION OF THE BATTERY POWER SUPPLY OF HYPERSONIC PROPULSION FACILITY.

Bunt, E. A. : Cusick, R. T. DESCRIPTIVE NOTE: Technical memo., FEB C5 59P Bunt, Bennett, L. W. ; 01sen, H. L. ; REPT. NO. TG-660

# UNCLASSIFIED REPORT

CONTRACT: NOW62 0604c

33 DESCRIPTORS: (\*HEATERS, HYPERSONIC WIND TUNNELS), (\*STORAGE BATTERIES, ELECTRIC ARCS), (\*HYPERSONIC WIND TUNNELS, HEATERS), POWER SUPPLIES, PLASMA MEDIUM, DESIGN, OPERATION, REMOTE CONTROL, SAFETY, SYSTEMS ENGINEERING SUPPLEMENTARY NOTE:

phenomenon. The control equipment includes a water-cooled ballast resistor and special switches to handle the making and breaking functions (which have been separated). Remote operation ensures cells for operating split-ring plasma arcs is discussed in the light of flight simulation requirements. Arc stability was considered in connection with operating limits caused by circuit transients and the onset of the voltage reversal A power supply composed of 1140 submarine leadacid the basic safety of personnel; numerous additional safety features have been incorporated. (Author)

3

AD- 466 991

GENERAL MOTORS CORP ANDERSON IND DELCO-REMY DIV

APPLIED RESEARCH INVESTIGATION OF SEALED SILVERZING BATTERIES.

DESCRIPTIVE NOTE: Technical rept., MAY 65 43? Lander, J. J. ;Keralla, J. A. MAY 65 43F L CONTRACT: AF33 657 10643

TDR-64-85-Suppl. 1 817304 MONITOR: APL

UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*BATTERY COMPONENTS, STORAGE BATTERIES), (\*STORAGE BATTERIES, MATERIALS), (\*BATTERY SEPARATORS, STORAGE BATTERIES), ELECTROLYTIC CELLS, ELECTROLYTES, MEMBRANES, SILVER, ZINC, SODIUM COMPOUNDS, POLYETHYLENE PLASTICS, POLYAMIDE PLASTICS, NITRILES, CELLULOSIC RESINS, POROVA MATERIALS, LIFE EXPECTANCY, PALLADIUM ALLOYS, SILVER ALLOYS, SEALS, ADDITIVES, VOLTAGE, (UDATA IDENTIFIERS: LITHIUM HYDROXIDES, POTASSIUM HYDROXIDE, SUPPLEMENTARY NOTE: Supplement 1 to report 4ated 1 Aug SODIUM HYDROXIDE 64. AD-603 023.

battery, there appeared to be no benefit from use of LidH electrolyte. Appreciable gains in cycle life were made by cells using 45% and 50% beneficial; these separators are inert in the alkali secondary cell as cycled in this program.
Additional development work on these membranes in the area of pore size reduction might prove not affect cycle life. For the purposes of this program relating to a long cyclic Ag-Zn secondary to regular NaOH and KOH electrolyte systems did environment, and resist chemical deterioration. NaOH electrolyte. Polypor films did not by themselves prove suitable for use in the Ag-Zn The use of LiOH either alone or as an additive (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

EAGLE-PICHER CO JOPLIN MO

3 INVESTIGATIONS LEADING TO THE DESIGN OF A RELIABLE SEALED NICKEL-CADMIUM CELL.

DESCRIPTIVE NOTE: Final rept., 1 May 63-30 Apr 64, Folks, Leroy ; Gosch, C. D. ; REPT. NO. 8 CONTRACT: DA36 039AMC00135E ,DA36 039sc89084 PROJ: 1G6 22001A053 02

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, ALKALINE BATTERIES), (\*ALKALINE BATTERIES, ELECTROLYTES), HYDROXIDES, POTASSIUM COMPOUNDS, ADDITIVES, LITHIUM COMPOUNDS, COBALT COMPOUNDS, OXIDES, ZINC COMPOUNDS, DESIGN, RELIABILITY, BATTERY SEPARATORS, NICKEL, CADMIUM, PERFORMANCE (ENGINERING), STORAGE, TEMPERATURE, LIFE EXPECTANCY, EXPERIMENTAL DATA, STATISTICAL ANALYSIS, ELECTRIC DISCHARGES, (U)ELECTRIC DISCHARGES SUPPLEMENTARY NOTE:

analyzed by the 't' test and by the half-normal plot. quarter as well as that of the entire contract is summarized. The purpose remained that of yielding an improved Ni-Cd cell. Four experiments were completed in this quarter: (a) Cycle Life Performance, (b) Self-Disch., (c) Experiment A followed the factorial design for main effects (27 cells) as delineated in PR 5. They were analyzed by the Analysis of Variance The investigative work carried forward in the last and yielded these significant effects: neg. linear trend with increasing KOH conc.: type separator; type neg.: 80% LiOH as additive. Experiment B followed the factorial design for main effects (16 cells) as delineated in PR 7. They were Significant effects were given. (Author)

UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 458 861 CARIBBEAN TRADING CORP FORT LAUDERDALE FLA LOW TEMPERATURE BATTERY (NEW MAGNESIUM ANDDE STRUCTURE).

 $\widehat{\Xi}$ 

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:
DESCRIPTORS: (\*LOW TEMPERATURE BATTERIES, DRY
BATTERIES), (\*DRY BATTERIES, PERFORMANCE (ENGINEERING)),
(\*ANDDES, MAGNESIUM), LIFE EXPECTANCY, CONTAINERS,
DESIGN, STORAGE, ELECTRICAL PROPERTIES, ELECTROLYTES,
MAGNESIUM COMPOUNDS, STRONTIUM COMPOUNDS, BROMIDES,
PERCHLORATES, BATTERY SCPARATORS, CORROSION, SODIUM
COMPOUNDS, CHROMATES

Investigations of shelf life and low temperature performance consisted principally of two shelf and two experimental design programs. Investigations of anode pitting and slow voltage recovery of the cell comprising seven screening programs, involving various modifications and combinations of cell components, were undertaken. Cleaning of the anode after forming with Dow 21 pickle minimized the pitting. The plastic cell closure has markedly improved the shelf life of the Balaquer 'D' size cell. Employing a seamless steel jacket in place of a seam steel jacket reduced the radial expansion during cell discharge. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 456 387 INLAND TESTING LABS DAYTON DHID INVESTIGATIONS LEADING TO THE DEVELOPMENT OF THE OPTIMUM METHOD(S) FOR CHARGING SEALED NICKELCADMIUM BATTERIES.

3

DESCRIPTIVE NOTE: Final rept., 1 Oct 62-30 Sep 63 and Addendum 4 May-4 Oct 64, OCT 64 10SP Luke, I. F. ; Koesters, R. L. ; REPT. NO. 4

REPT. NO. 4 CONTRACT: DA36 039sc90823 PRDJ: 1C6 22001A053

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*BATTERY CHARGERS, DESIGN), (\*STORAGE
BATTERIES, BATTERY CHARGERS), (\*BATTERY COMPONENTS,
STORAGE BATTERIES), NICKEL, CADMIUM, DPTIMIZATION,
VOLTAGE, ELECTRIC CURRENTS, TABLES(DATA), TEST METHODS,
ELECTRIC DISCHARGES, LOW TEMPERATURE, (U)LOW
TEMPERATURE
IDENTIFIERS: BATTERY DISCHARGE, FACTORIAL DESIGN (U)

Experiment designs, test data, analyses and results for investigations of constant current and constant potential charging at 125, 75, -10 and 40 F for cells at different initial states of charge are presented. Results of a preliminary investigation of pulse charging at -40 F are also presented. Experiments include test variables of ambient cell temperature, charging period, charging potential, percent input, initial state of charge, cell size and discharge rate depending upon the type of charging method employed. Cells of type BB 412 ()/u and BB 440()/U were used in these investigations. Analysis of the charging procedures are based upon the percent capacity obtained at the test conditions to that obtained in a normalizing cycle at 75 F. The average of the results obtained at 75 and 125 F following constant current charges was greater than that following constant current charges over the selected levels of the test variables. (Author)

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UNCLASSIFIED

PAGE

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DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

MONSANTO RESEARCH CORP EVERETT MASS

RESEARCH ON ORGANIC DEPOLARIZERS

DESCRIPTIVE NOTE: Final rept., 1 Jul 61-30 Jun 64, Jun 64, 175P Gruber, B. A.; McElhill, E.

A. :Williams.D. L. ;
REPT. NO. 4006F
CONTRACT: DA36 039sc87336

1G622001A053 PROJ: 10

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*PRIMARY BATTERIES, POLARIZATION),
(\*POLARIZATION, INHIBITION), ELECTROLYTES, MAGNESIUM
COMPOUNDS, PERCHLORATES, NITROBENZENES, CARBON BLACK,
ACETATES, AMMONIUM COMPOUNDS, NITRATES, PHOSPHATES,
BROMIDES, SOCIUM COMPOUNDS, RESISTANCE (ELECTRICAL),
CATHODES, NITROGEN HETEROCYCLIC COMPOUNDS, BROMINE
COMPOUNDS, CHLORINE COMPOUNDS, IODINE COMPOUNDS,
FLUORINE COMPOUNDS, PEROXIDES, SULFOXIDES, HYDROXIDES,

ELECTROCHEMISTRY

IDENTIFIERS: ACETATE/AMMONIUM, AMMONIUM COMPOUNDS, NITRATES, AMMONIUM PHOSPHATE, AMMONIUM BROMIDE, MAGNESIUM PERCHLORATE, SODIUM

3

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3 experimental and theoretical coulombic capacities and for both load and open-circuit potentials. The potentials with high efficiencies even at high drain rates. However, most positive halogen compounds have only limited stability in water. Certain peroxides have relatively high load potentials and and coulombic capacity, nitro compounds were studied About 200 organic compounds were tested as cathode materials. The results are tabulated for both positive halogen compounds (ROX and RNX), halogen are efficiently reduced, but their theoretical capacity is limited. Because of their high energy best depolarizers generally belong to one of the following groups: nitro compounds (RND2), (ROOR). The positive halogen compounds and the halogen addition compounds discharge at high addition compounds (R3NX2) or peroxides most intensively. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

LITTLE (ARTHUR D) INC CAMBRIDGE MASS

LOW TEMPERATURE OPERATION OF BATTERIES.

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DESCRIPTIVE NOTE: Final rept., 15 May 62-14 Jul 64, Jul 64, 236P Horne, R. A. ; Richardson.D. Horne, R. A. ; Richardson, D.

CONTRACT: DA36 039sc90706 PROJ: DA36 039sc90706

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LOW TEMPERATURE BATTERIES, ENVIRONMENTAL
TESTS), (\*BATTERY COMPONENTS, ENVIRONMENTAL TESTS), COLD
WEATHER TESTS, PERFORMANCE (ENGINEERING),
BIBLIOGRAPHIESS, THERMAL INSULATION, THICKNESS,
OPERATION, TEMPERATURE, HEATERS, THERMAL PROPERTIES,
DATA, ALKALINE BATTERIES, NICKEL, CADMIUM, MAGNESIUM,
MERCURY, SILVER, ZINC, STORAGE BATTERIES, AMMONIA,
TABLES(DATA), ELECTROCHEMISTRY, ENERGY CONVERSION,
(U)ENERGY CONVERSION DESCRIPTORS:

3

temperature performance of batteries, the properties of available insulating materials, estimates of the weight, cost, and volume of various auxiliary heating devices, and experimental studies of the cool-down rates of insulated battery systems, the following conclusions have been reached: (1) present inexpensively insulated conventional batteries should batteries are serviceable in conditions of extreme cold for very short mission lives or very low current On the basis of a comparitive evaluation of the low auxiliary heat or superinsulation is required; and be serviceable; (3) for somewhat longer missions, drains; (2) for missions a few hours in length, auxiliary heat, preferably in conjunction with inexpensive insulation, is necessary. (Author) (4) for long missions (in excess of 8 hours)

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ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

AD- 442 516

GENERAL ELECTRIC CO SCHENECTADY N Y

3 LOW TEMPERATURE BATTERY (NEW MAGNESIUM ANODE STRUCTURE).

Semiannual rept. no. 1, 1 Oct 63-31 Balaguer, Rodol fo R. ; DESCRIPTIVE NOTE: Mar 64.

REPT. NO. CONTRACT:

CONTRACT: DA36 039AMC03369E TASK: 1G6 22001A053 02

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*LOW TEMPERATURE BATTERIES, DRY
BATTERIES), (\*DRY BATTERIES, PERFORMANCE (ENGINEERING)),
(\*PRIMARY BATTERIES, MAGNESIUM), (\*ANODES, MAGNESIUM),
LIFE EXPECTANCY, ELECTROLYTES, DESIGN, CAPACITANCE,
RESISTANCE (ELECTRICAL), ELECTRODES, STRONTIUM
COMPOUNDS, TABLES(DATA), BATTERY SEPARATORS, MAGNESIUM
COMPOUNDS, ODIUM COMPOUNDS
IDENTIFIERS: BATTERY DISCHARGE, MAGNESIUM BROMIDE,
MAGNESIUM PERCHLORATE, SODIUM CHROMATE, STRONTIUM

promising for improved shelf life. Further electrolyte studies are indicated for the improvement modifications and combinations of cell components. Investigations of shelf life and low temperature performance of the magnesium Balaguer cell consisted principally of two shelf and three experimental design programs, involving various The use of a plastic bottom closure in place of tinned steel was developed and appears highly of low temperature performance. (Author)

### UNCLASSIFIED

ZOM07 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

MALLORY BATTERY CO TARRYTOWN N Y AD- 439 454

TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND BATTERIES.

3

DESCRIPTIVE NOTE: Semi-annual rept. no. 6, 15 Mar-31

Goodman, Roger ; CONTRACT: DA36 039SC78320 TASK: 1G6 22001 A 053 02 44P JUL 63 July 63.

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, TESTS), (\*ALKALINE BATTERIES, TESTS), (\*BATTERIES AND COMPONENTS, PRIMARY BATTERIES), STORAGE, ZINC, MERCURY COMPOUNDS, OXIDES, SUPPLEMENTARY NOTE:

33 IDENTIFIERS: BATTERY DISCHARGE, MERCURY(II) DXIDE

3 batteries of the zinc-alkaline-mercuric oxide system. Initial discharge data for cell type 650R at temperatures from 20 to 200 F. and 70 F. rates of discharge from 1 to 100 hours was completed. Monthly EMF readings on nine cell types are the sicth semi annual report period in the testing presented in summarized form. Delayed discharge test results are presented for cell types 42R at months, 502R at 18 months, 625R at 12 months, 650R at 1, 2, and 3 months, 1438R at 6 months, and 1450R at 12 months. (Author) and evaluation of primary alkaline cells and The Cell Test Program has advanced through

PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

GULTON INDUSTRIES INC METUCHEN N J AD- 435 989

INVESTIGATION OF METHODS LEADING TO THE DETERMINATION OF THE STATE OF CHARGE OF NICKEL-CADMIUM BATTERIES.

DESCRIPTIVE NOTE: Final rept., 1 Jan-30 Dec 63, DEC 63 97P Wartell, J. ; Seigen, H. N.

TE: DA36 039AMC00109E PROJ:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*ALKALINE BATTERIES, TEST EQUIPMENT), (\*TEST EQUIPMENT, BATTERY COMPONENTS), ELECTRIC BRIDGES, CIRCUITS, CALIBRATION, NICKEL, CADMIUM, MEASURING DEVICES (ELECTRICAL AND ELECTRONIC), STORAGE, DESIGN, 3 SUPPLEMENTARY NOTE: (U)DESIGN

placed on storage did not show any significant change tested at 10 cps. BB418 cells were manually cycled, automatically cycled, and stored and C and R sub c measured as a function of time and residual most consistent results, namely that a correlation was found with residual capacity after cells were BB418 cells as a function of residual capacity and time at 200 and 400 cps. No useful correlation was found with the equivalent circuit product CR sub c for low frequency data taken previously. To pursue this further, different types of cells were cells did not show any consistent relation between recently charged or discharged. Circular, sealed with residual capacity was found. A correlation capacaty at 10 cps. The BB418 cells showed the Equivalent circuit measurements were made on C or R sub c and residual capacity. Cells of C or R sub c with time on storage. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AD- 434 589

ARMY ELECTRONICS LABS FORT MONMOUTH N J

3 RESPONSE SURFACE DETERMINATIONS IN ESTABLISHING THE RELIABILITY OF ONE-SHOT ITEMS,

Wilburn, Nicholas T.

DA-1-G-622001-A-053 REPT. NG. TR-2428 PROJ: DA-1-G-622001-A-053 TASK: 1-G-622001-A-05302

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*GUIDED MISSILE BATTERIES, RELIABILITY (ELECTRONICS), (\*RÉLIABILITY (ELECTRONICS), DETERMINATION), THEORY, ENVIRONMENTAL TESTS, TEMPERATURE, VIBRATION, TIME, MATHEMATICAL PREDICTION, MATHEMATICAL MODELS, ANALYSIS OF VARIANCE, EQUATIONS SUPPLEMENTARY NOTE:

3

3 The response surface determination (RSD) method is proposed for the determination of mean failure points and reliability tolerance limits for a battery effects of interactions between forces on the battery performance. Emphasis is placed on providing a the analysis of the battery responses as a function simultaneously, thus affording information on the maximum of reliability prediction data with small design with respect to operational environmental conditions, thermal and dynamic. It provides for of two or more environmental stresses, acting test sample sizes. (Author)

AD- 435 989

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 433 973

NAVAL ORDNANCE LAB CORONA CALIF

3 SIXTH SYMPOSIUM ON AMMONIA BATTERIES AT UNIVERSITY OF CALIFORNIA, BERKELEY, CALIFORNIA. JANUARY 3031,

64 75P NOLC-597

# UNCLASSIFIED REPORT

3 3 DESCRIPTORS: (\*SYMPOSIA, BATTERIES AND COMPONENTS), (\*LOW TEMPERATURE BATTERIES, ANMONIA), (\*AMMONIA, LOW TEMPERATURE BATTERIES), ELECTROLYTES, ELECTRODES, SOLUTIONS(MIXTURES), LIQUEFIED GASES, SULFOXIDES, NITROBENZENES, SILVER COMPOUNDS, CHLORIDES, LITHIUM COMPOUNDS, CARBONATES, ALKENES, ELECTROCHEMISTRY, STATISTICAL ANALYSIS (CHLORIDE, PROPYLENE CARBONATE, LEWIS ACIDS, LITHIUM CHLORIDE, PROPYLENE CARBONATE, SILVER CHLORIDE, (CHLORIDE, DIMETHYL

detailed discussion among all government agencies and their contractors active in ammonia battery research speakers, reprinted as received. The actual proceedings of the symbosium will not be transcribed or abstracted as they were in previous years. requirements, and promotion of increased fundamental research in nonaqueous electrochemistry are experimental problems and of methods applicable to their solution is of vital interest and benefit to everyone in the field. Cooperative program planning, orientation to longrange military These periodic meetings are scheduled to encourage additional goals. This report contains the extended abstracts furnished in advance by the and development. Review of theoretical and

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 430 864

NAVAL AMMUNITION DEPOT CRANE IND

3 QUALIFICATION TEST OF FIVE AIRCRAFT BATTERIES, LEAD ACID, TYPE MS25211-2, MANUFACTURED BY GILL ELECTRIC MANUFACTURING CORPORATION.

64 FEB

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*AIRCRAFT EQUIPMENT, STORAGE BATTERIES), (\*STORAGE BATTERIES, AIRCRAFT EQUIPMENT), (\*BATTERY COMPONENTS, MILITARY REQUIREMENTS), LEAD(METAL), PERFORMANCE (ENGINEERING), ENVIRONMENTAL TESTS, ELECTROLYTES, TESTS, ALTITUDE CHAMBERS, SHOCK (MECHANICS), VIBRATION, THERMAL STRESSES, ACIDS, SUPPLEMENTARY NOTE: (U)ACIDS

3

Qualification tests were conducted on five batteries Type MS25211-2, 12 cell, 24 volt, lead acid aircraft storage battery having a rated capacity of 20 ampere-hours at the 2-hour rate. (Author)

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ZOMO2

PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

MELPAR INC FALLS CHURCH VA

A THIN-PLATE BATTERY

DESCRIPTIVE NOTE: Supplement to final summary rept. 16 Smit, J. ; Titus, H. H. Feb 6115 Nov 63, NOV 63 13P

NOW-60-0362 Foley.R. T. : CONTRACT:

### UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, AMMONIA), (\*LOW TEMPERATURE BATTERIES, AMMONIA), (\*ELECTROLYTIC CELLS, AMMONIA), BENZENE, NITRATES, AMMONIUM COMPOUNDS, ORGANIC SULFUR COMPOUNDS, POTASSIUM COMPOUNDS, MAGNESIUM, ELECTROLYTES, ELECTRODES, DESIGN, ENCAPSULATION, NITROBENZENES, THIOCYANATES SUPPLEMENTARY NOTE: Report on Molecular Circuit

DENTIFIERS: AMMONIA BATTERIES, POTASSIUM THIOCYANATE

3

techniques applicable to encapsulated unit production overcome by increased intercell spacing and grooving. Several packaging and component-fabrication leading factor in performance degradation. Other factors of significance are current density, electrolytic solution concentration, and cell thickness and weight. A pronounced change in cell performance was obtained through the salt selection in the electrolytic solution. Preliminary studies Cell performance was affected grossly by componentfixture-tested, multiple-cell units revealed an Initial investigations utilized the single cell as fabrication procedures. Volatilization of m-DNB is directly related to these procedures and is a the test vehicle. Tests, with a few exceptions, were conducted on either the Mg/KCNS in NH3/melectrolytic solution feeding problem which was DNB+C or Mg/NH4SCN in NH3/mDNB+C system.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

CARIBBEAN TRADING CORP FORT LAUDERDALE FLA

LOW TEMPERATURE BATTERY (NEW MAGNESIUM ANODE STRUCTURE).

3

3 DESCRIPTIVE NOTE: Semiannual rept. no. 2, 1 Apr-30 Sep

Balaguer, Rodolfo R. CONTRACT: DA36 039AMC00021E TASK: 1G6 22001A053 02 2 SEP 63 CONTRACT:

### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

3 DESCRIPTORS: (\*LOW TEMPERATURE BATTERIES, DRY
BATTERIES), (\*ANODES, MAGNESIUM), BATTERIES AND,
MANGANESE COMPOUNDS, OXIDES, HYDROXIDES, BROMIDES,
PERCHLORATES, MAGNESIUM COMPOUNDS, CARBON BLACK,
STRONTIUM COMPOUNDS, CHROMATES, BARIUM COMPOUNDS,
COMPOUNDS, ELECTROLYTES, BATTERY SEPARATORS,
ENVIRONMENTAL TESTS, HEAT, STORAGE, EFFECTIVENESS
IDENTIFIERS: BARIUM CHROMATE, MAGNESIUM BROMIDE, MAGNESIUM HYDROXIDE, MAGNESIUM PERCHLORATE, MANGANESE(IV) OXIDE, SODIUM CHROMATE, STRONTIUM

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3 mon th) at 113 F and 130 F performance results are reported for experimental cells. Natural and chemical manganese dioxide and Mg Br2 electrolyte were employed in combination with 1/32 in. carbon cup separators. The low temperature characteristics of wall and different magnesium anode thickness and Initial (0 month) at 70 and after storage (1 the cells were also studied. (Author)

were evaluated. (Author)

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

LIQUID AMMONIA RESERVE BATTERIES FOR GUIDED MISSILE FUZING. FEASIBILITY STUDY. NAVAL ORDNANCE LAB CORONA CALIF

DESCRIPTIVE NOTE: Final rept., nfc 63 63P Spindler, William C.; Daley,

8178 MONITOR: NAVWEPS

# UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*GUIDED MISSILE BATTERIES, GUIDED MISSILE FUZES), (\*GUIDED MISSILE FUZES, GUIDED MISSILE BATTERIES), (\*GUIDED MISSILE BATTERIES), LIQUEFIED GASES, AMMONIA, ELECTROLYTES, POWER SUPPLIES, ELECTROCHEMISTRY, FEASIBLIITY STUDIES, MAGNESIUM, AMMONIUM, COMPOUNDS, POTASSIUM COMPOUNDS, THIOCYANATES, SILVER, OXIDIZERS, AROMATIC COMPOUNDS, NITRATES, SULFUR COMPOUNDS SUPPLEMENTARY NOTE:

battery has been established for short-life, reserve primary applications, and all attributes required for service in guided missile fuzes have now, for the first time, been demonstrated in a single package. The battery delivers the full electrical output The feasibility of a liquid ammonia experimental under all environmental conditions and meets the selfcontained activator mechanism. (Author) volume limitation, including space for the

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMD7

BRIGHT STAR INDUSTRIES CLIFTON N J

MAGNESIUM FLAT CELL BATTERIES

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DESCRIPTIVE NOTE: Final rept., 30 Sep 58-30 Oct 63, OCT 63 1V Pette, Richard A.; CONTRACT: DA36 039sc78231 TASK: 1G6 22001A053 02

UNCLASSIFIED REPORT

3 DESCRIPTORS: (\*BATTERIES AND COMPONENTS, DRY BATTERIES), (\*DRY BATTERIES, MAGNESIUM), MANUFACTURING, ANDDES, ZINC, ELECTROLYTES, MAGNESIUM, BROMIDES, CORROSION INHIBITION, PICKLING COMPOSITIONS, RESISTANCE (ELECTRICAL), REDUCTION, ZINC COATINGS, PERFORMANCE (ENGINEERING), STORAGE, HUMIDITY, TROPICAL TESTS, CATHODES, MANGANEE COMPOUNDS, OXIDES, CARBON, BARIUM COMPOUNDS, CHROMATES, HYDROGEN, PRODUCTION, PRESSURE, DENTIFIERS: MAGNESIUM BROMIDE, MANGANESE(IV) RUPTURE, CONTAINERS SUPPLEMENTARY NOTE:

3

choice of sealing materials. Capacity data on the effects of various parameters studied were obtained. through adequate venting of hydrogen gas and proper Development of a Mg/MgBr2/MnO2 flat cell battery was undertaken. Areas of investigation that re ceived special attention were conductive formulations, duplex electrode and ceil assembly techniques. Increased capacity was obtained coating of magnesium alloys, cathode mix

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PAGE

UNCLASSIFIED

AD- 427 070

diodes.

3

slopes and current handling capability. Similarly, the anti-reversal approach consisted of utilizing the

volt-ampere characteristic of semiconductor P-N junctions was investigated in depth. Semiconductor

diodes were designed and tested for specific V-I

low forward drop of especially fabricated Ge diodes

which were placed across the cell terminals, in

parallel to, but in polarity opposing the equalizer

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

MALLORY (P R) AND CO INC BURLINGTON MASS

CELL EQUALIZATION TECHNIQUES.

3

Whoriskey, Peter J. ; DESCRIPTIVE NOTE: Final rept., DEC 63 28P Whorisk CONTRACT: AF33 657 8749

TDR63 4137 817304 18 MONITOR: RTD

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*SOLAR CE.LS, STORAGE BATTERIES), (\*STORAGE BATTERIES, SOLAR CELLS), (\*ALKALINE BATTERIES, SOLAR CELLS), (\*ALKALINE BATTERIES, SOLAR CELLS), NICKEL, CADMIUM, DIODES (SEMICONDUCTOR), GERMANIUM, LIFE EXPECTANCY, SILICON, SILVER, ZINC, ELECTRIC DISCHARGES, BATTERIES AND COMPONENTS (U) SUPPLEMENTARY NOTE:

A space vehicle power supply consists of certain types of hermetically sealed alkaline battery Cells coupled with solar cells. During usage these alkaline battery cells, series connected, are repeatedly subjected to charge-discharge cycles that can produce cell failure. These failures are, in turn, attributable to inherent cell differences intersified by cycling rate, overall cycling time and evolution of gas in sufficient quantities to destroy the cell, and (b) cell reversal on discharge that depth of discharge. The prime failure modes consist of: (a) unequal cell charge which causes the ultimately results in cell failure. The objectives of this program were, accordingly, to investigate: (1) methods of equalizing the terminal voltage of the individual cells on charge, and (2) methods of preventing cell reversal upon discharge. To achieve cell equalization, the logarithmic forward effectively cancels the cell from the circuit and

#### UNCLASSIFIED

DUC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 426 195 PICATINNY ARSENAL DOVER N J

3 STATISTICAL TEST PLAN FOR EVALUATION OF FLASHLIGHT-Size manganese-alkaline-zinc battery,

Weintraub, Gertrude ; Vander Mass, Daniel A.; Shaw, Donald N.; REPT. NO. PA-TM-1221

101.10.00.60.N5-01

# UNCLASSIFIED REPORT

(ENGINEERING)), (\*FIRING MECHANISMS (AMMUNITION), MINES (ORDNANCE)), ANTITANK AMMUNITION, MANGANESE, ZINC, TESTS, ELECTRICAL PROPERTIES, STORAGE, LIFE EXPECTANCY, STATISTICAL TESTS SUPPLEMENTARY NOTE:
DESCRIPTORS: (\*ALKALINE BATTERIES, PERFORMANCE

3 This report discusses a statistical test plan to be A statistically-designed electrical test program was devised to determine shelf life, amperehour capacity and reliability of manganesealkaiine-zinc batteries in connection with the XM61 Demolition Firing Device for the XM24 Anti-Tank evolved by Picatinny Arsenal and Signal Corps used for evaluating the battery during the Mine being developed by Picatinny Arsenal. Production Engineering Measure Program -personnel. (Author)

AD- 426 195

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

AD- 425 938

EAGLE-PICHER CO JOPLIN MO

RESEARCH INVESTIGATIONS LEADING TO THE DEVELOPMENT AND EVALUATION OF A CADMIUM - SILVER OXIDE BATTERY HAVING A HERMETICALLY SEALED CONSTRUCTION.

DESCRIPTIVE NOTE: Rept. no. 12 (final), 1 July 62-30 June 63.

Wilson, J. K. ; JUL 63 165P TASK: 1G6 22001A053 02

# UNCLASSIFIED REPORT

Availability: No Limitation.

SUPPLEMENTARY NOTE:
DESCRIPTORS: (\*ALKALINE BATTERIES, PERFORMANCE
(ENGINEERING)), (\*SATTERIES AND COMPONENTS, ALKALINE
BATTERIES), (\*STORAGE BATTERIES, ALKALINE
BATTERIES), (\*STORAGE BATTERIES, ELECTROLYTIC CELLS,
BATTERY SEPARATORS, ENVIRONMENTAL TESTS, WET CELLS,
ELECTRICAL PROPERTIES, RESISTANCE (ELECTRICAL), ELECTRIC
DISCHARGES, ELECTRIC POTENTIAL, POLYETHYLENE PLASTICS,
CELLULOSIC RESINS, POLYVINYL ALCOHOL, MEMBRANES, NYLO(U)
IDENTIFIERS: BATTERY DISCHARGE, SILVER OXIDE
(U)

3 discharge, charge efficiency, and life characteristics of cells utilizing the positive plate at both the divalent and monovalent capacity levels are discussed. Sufficient data have been accumulated to allow the construction of sealed cells directed toward the attainment of a reliable sealed cadmium - silver oxide battery. Among the areas investigated and discussed are improvement in separation, capacity efficiency, overcharge characteristics, retention-of-capacity at temperatures from -65 to +165 F, and hermetic seals. In addition, the voltage, capacity, self-Research, development and design efforts have been with acceptable performance characteristics suggesting that the program be advanced to the applied and production phases. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 425 407

GENERAL DYNAMICS/ASTRONAUTICS SAN DIEGO CALIF

3 RE-ENTRY AND DISPOSAL PHENOMENA FOR NUCLEAR AUXILIARY POWER SYSTEMS, THE SCALING OF PROCESSES OF SIGNIFICANCE IN THE RE-ENTRY OF NUCLEAR FUEL ELEMENTS.

Leadon, B. M. ; NOV 63 39P L REPT. NO. GDA-AE63-0138 CONTRACT: AF 29(601)-5893 PROJ: AF-1831

183101 TASK:

TDR-63-3002 RTD MONITOR:

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

3 DESCRIPTORS: (\*NUCLEAR POWER PLANTS, ATMOSPHERE ENTRY), (\*REACTOR FUEL ELEMENTS, ATMOSPHERE ENTRY), (\*REACTOR FUEL ELEMENTS, ATMOSPHERE ENTRY), SPACE PROPULSION, NUCLEAR REACTORS, DISPOSAL, DESCENT TRAJECTORIES, REENTRY VEHICLES, AERODYNAMIC HEATING, THERMAL STRESSES, SORPTION, MODEL TESTS, DIFFERENTIAL EQUATIONS, TUMBLING, HYPERVELOCITY FLIGHT, AUXILIARY POWER PLANTS, RADIOACTIVE WASTES, FALLOUT

degassing, and the resulting stressing of homogeneous solids are capable of only very limited simulation in model tests. A new kind of stressing, due to outgassing, is discussed. (Author) heating, thermal stresses and transient temperature, gas desorption, and sorption expansion in homogeneous solids. Prototype scale trajectories are found to be possible using scale models in the case of spheres well-known semi-empirical equations, to be simulated under certain conditions. Transient heating, hypervelocity flight or ground test is shown, from Model scaling laws are formulated for several physical phenomena associated with re-entry and dispersal of the debris from an orbiting nuclear reactor or power source. These phenomena include nonlifting and tumbling free fall, aerodynamic or tumbling rods. Aerodynamic heating in

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

422 077

GENERAL MOTORS CORP ANDERSON IND DELCO-REMY DIV

3 SILVER-ZINC SECONDARY BATTERY INVESTIGATION

DESCRIPTIVE NOTE: Rept. for July 62-Aug 63. OCT 63 76P Lander,J. J. ;Keralla,J. A.

CONTRACT: AF33 657 8943

TASK: 817304 1 PROJ: 8173

TDR-63-4029 MONITOR: RTD

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

(ENGINEERING)), (\*ALLVER, STORAGE BATTERIES, PERFORMANCE (ENGINEERING)), (\*SILVER, STORAGE BATTERIES), (\*ZINC, STORAGE BATTERIES), (\*ZINC, STORAGE BATTERIES AND COMPONENTS, PALLADIUM, ADDITIVES, ELECTROLYTIC CELLS, HYDROGEN, IMPREGNATION, PLYVINYL ALCOHOL, ELECTRIC POTENTIAL, PARTICLE SIZE, BATTERY SEPARATORS, MEMBRANES, PENETRATION, TABLES(DATA), FAILURE (MECHANICAL), DATA, DOWDER METALS, PHOTOMICROGRAPHY, HYDROXIDES, POTASSIUM (U) " ?IPTORS: (\*STORAGE BATTERIES, PERFORMANCE

3 plate appreciably increases cycle life, maintains the monovalent charge capacity for 500 to 1000 cycles, separators. Thirty-five hundred cycles were attained by 25 a.h. cells at 25% depth of discharge containing 1% palladium impregnated positive plates. Silver particle sizes studied in the micron range of greater than 1 to 12 do not appreciably affect voltage, capacity, or cycle life of silver alcohol as a binder material in the negative active marked reduction in rates of hydrogen generation on material increases negative plate life. Increasing Hg content of the negative plate active material One percent palladium added to the silver positive Increasing MgO content results in decreased cycle life. Two batteries containing 1%-palladium alkali concentration (45%) tend to yield maximum cycle life performance. The use of polyvinyl and increasing KOH concentration both result in plates. Low current density operation and high coated silver were cycle life tested. (Author) and tends to reduce silver migration through stand in the temperature range 75 to 125 F.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AD- 421 049

CALVIN COLL GRAND RAPIDS MICH

SILVER MIGRATION AND TRANSPORT MECHANISM STUDIES IN SILVER OXIDE-ZINC BATTERIES.

DESCRIPTIVE NOTE: Final rept.,

Dirkse, T. P. SEP 63 47P CONTRACT: AF33 657 8689

81730416 8173

TDR63 863 MONITOR: ASD

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*SILVER, DIFFUSION), (\*ALKALINE BATTERIES, ELECTRODES), TRACER STUDIES, TRANSPORT PROPERTIES, BATTERY SEPARATORS, POTASSIUM COMPOUNDS, HYDROXIDES, ELECTROLYTES, SILVER COMPOUNDS, OXIDES, ZINC (1 SUPPLEMENTARY NOTE:

3

3 separator materials have been tested with respect to reactivity with dissolved silver oxides as well as Silver is transported from the silver electrodes in silver-alkaline batteries. This study has been made using radioactive silver tracers as well as by battery. Generally, effectiveness in preventing transport is due to reaction with the silver oxide dissolved in the potassium hydroxide electrolyte. the effectiveness of a given separator material in straight analytical techniques. This transport is wo screening tests have been devised for testing with respect to effectiveness in preventing the transport of silver in a working silver-alkaline due primirily to diffusion. Various kinds of A study has been made of the methods by which Preventing the transport of silver. (Author)

PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

EAGLE-PICHER CO JOPLIN MO AD- 421 035

 $\hat{\Xi}$ INVESTIGATIONS LEADING TO THE DESIGN OF A RELIABLE SEALED NICKEL-CADMIUM CELL.

DESCRIPTIVE NOTE: Final rept. 1 May 62-30 Apr 63, MAY 63 22P Cupp, E. B.; CONTRACT: DA36 039sc89084

PROJ: 3A99 09 002

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*SIGRAGE BATTERIES, ELECTRICAL PROPERTIES), (\*ELECTROLYTIC CELLS, STORAGE BATTERIES), NICKEL, CADMIUM, ELECTROLYTES, POTASSIUM COMPOUNDS, HYDROXIDES, ADDITIVES, ELECTRIC DISCHARGE, RELIABILITY, STORAGE, ELECTRODES SUPPLEMENTARY NOTE:

3 and demonstrate the influence of temperature and time on the degradation of capacity in both positive and negative plates. Both types of plates illustrated the ability to recain a least 70% of original capacity after six months storage at +90 F. The effects of addition agents such as lithium and zinc are recorded, and definite influence in shown under Studies of various cell components were made and evaluated. Charge retention studies are detailed fixed conditions of charge and discharge.

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

AD- 418 143

TELECOMMUNICATIONS RESEARCH ESTABLISHMENT MALVERN (ENGLAND) 6SEALED SILVER-CADMIUM BATTERY INVESTIGATION

3

DESCRIPTIVE NOTE: Rept. for May 61-May 63, AUG 63 1V Rice, James M.; AUG 63 1V Ri CONTRACT: AF33 600 42988 PROJ: 8173

TDR63 560 MONITOR: ASD

# UNCLASSIFIED REPORT

Conversion Technology.

DESCRIPTORS: (\*ALKALINE BATTERIES, DESIGN), CHE, DRGANIC COMPOUNDS. OXIDES, GASES, RECOMBINATION, POTASSIUM COMPOUNDS, HYDROXIDES, SILVER, CADMIUM, DESIGN, ELECTRODES, SEALS, ELECTROLYTES, SEPERATION, LIFE, TESTS, EXPERIMENTAL DATA, PERFORM, (U SUPPLEMENTARY NOTE: Report on Static Energy

3

3 This report covers a research and development program leading to a long life, deep cyclic, sealed silver-cadmium battery. Organic chalating agents were investigated for their effect on silver-oxide solubility. Organic addition agents were studied for gas recombination. Several separator systems have been evaluated. Test cells were built to evaluate plate designs. A study of the solubility of silver-oxide in potassium hydroxide was made. have been presented. A test report and prototype tested. Cycle test results and failure analyses Seventy-five sealed cells were assembled and specification are included. (Author)

AD- 421 035

PAGE

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 416 202 BOEING CO SEATTLE WASH QUALIFICATION TEST REPON, FOR MODEL SPECIFICA TION S-133-11-1-10 AND QUALIFICATION SUPPLEMENT I THEREOF, BATTERY STORAGE, LAUNCH FACILITY, (U)

FEB 63 1. Niebauer,K.:Atkinson,T.H.;

CONTRACT: AF04 647 289

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*STORAGE BATTERIES, EXPERIMEN), VIBRATION, SHOCK RESISTANCE, ELEC, HUMIDITY, HIGH ALTITUDE, TEM, FUNGUS DETERIORATION, LIFE EX, PERFORMANCE(HUMAN), DATA, SPECIFICA, MILITARY REQUIREMENTS, TESTS, TEST, MOISTURE, TEST EQUIPMENT. (U)

Qualification test report: storage batteries.

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 412 905

MALLORY BATTERY CO TARRYTOWN N Y

TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND BATTERIES. (U)

DESCRIPTIVE NOTE: Semi annual rept. no. 5, 1 Aug 62-15 Mar 63,

MAR 63 82P Goodman , Roger ;

CONTRACT: DA36 039sc78320

TASK: 3A99 09 002 02

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*PRIMARY BATTERIES, ALKALINE BATTERIES), (\*ALKALINE BATTERIES, TESTS), TABLES(DATA), LOW TEMPERA, UATA, ZINC, OXIDES, MERCURY (U)

The Cell Test Program under Signal Corps
Contract No. DA-36-039 SC-78320 has
advanced through the fifth semi annual report period
in the testing and evaluation of primary alkaline
cells and batteries of the zinc-alkaline-mercuric
oxide system. Initial discharge data for cell
types 625R, 1438R and 1450R at temperatures
from minus 20 to 200 F and at 70 F. rates of
discharge of 100 hours and less was completed.
Type 650R cell was introduced in the program and
partial initial discharge data is given. Monthly
EMF readings covering this period for all nine cell
types are presented. Delayed discharge after
storage at temperatures from -20 to 160 F. was
continued on eight cell types. The 650R cell
was introduced in the program late in the report
(Author)

3

UNCLASSIFIED

331

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

HOEING CO SEATTLE WASH

3 QUALIFICATION TEST REPORT FOR MODEL SPECIFICATION S-133-111-1-4 AND QUALIFICATION SUPPLEMENT I THEREOF, BATTERY, STORAGE, LAUNCH CONTROL FACILITY,

REPT. NO. Document no. D2 9960 2 CONTRACT: AF04 647 289

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*SICRAGE BATTERIES, ACCEPTABILI), ELECTRIC INSULATION, VISUAL INSPECTION, ENVIRONMENTAL TESTS, STORAGE, GROUND SUPPORT, RELIABILITY. (U)

Qualification test report for model specification S-133-111-1-4 and supplement I storage battery, launch control facility.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO? DDC REPORT BIBLIOGRAPHY

AD- 411 263

BOEING CO SEATTLE WASH

3 QUALIFICATION TEST REPORT FOR MODEL SPECIFICATION S-133-111-1-10 ADN QUALIFICATION SUPPLEMENT I THEREOF, BATTERY STORAGE, LAUNCH FACILITY,

Barton, W. H. FEB 63 94P CONTRACT: D2 9959 2

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:
DESCRIPTORS: (\*STORAGE BATTERIES, TESTS), (\*TESTS, STORAGE BATTERIES), SAND, ELECTRIC INSULATION, ENVIRONMENTAL TESTS, FUNGI, RAINFALL, CONTAINERS, ELECTRIC CURRENTS, ELECTRIC DOTENTIAL, ELECTRICAL FORDERTIES, ELECTRICAL RESISTANCE, HUMIDITY, LIFE EXPECTANCY, MECHANICAL PROPERTIES, SHOCK RESISTANCE, TEMPERATURE, VELOCITY, VIBRATION, SPECIFICATIONS, TEST EQUIPMENT, TEST METHODS

TACTICAL AIR COMMAND LANGLEY AFB VA

Operational Test and Evaluation Silver-Zinc Battery Cell Replacement,

 $\widehat{\Xi}$ 

Gillis, Ralph J. ; Casey, Howard E. :Trimble,Robert C. :Allen.Robert C. :Whitham,Clifford J. , Jr: REPT. NO. TAC-Test-61-73 MONITOR: TAC TR61 73 150

# UNCLASSIFIED REPORT

DESCRIPTORS: (\*BATTERY COMPONENTS, MAIN), LIFE EXPECTANCY, FEASIBILITY, OPERATION, PROCESSING, RELIABILITY, SUBSTITUTES, TESTS, SILVER, ZINC, IDENTIFIERS: SILVER ZINC BATTERY CELLS MAINTENANCE., (U) MAINTENANCE.

maintenance activities. Analysis indicates that it is practical to replace cells in batter les having up to fifteen months service. Under test conditions, battery life was extended an average of 5.24 months techniques were developed during the test that will This test determined that individual cells could be aid in increasing the service life of this battery. replaced in the silver-zinc battery by field level improper use and handling was a large contributing factor to bat tery failure. An aggressive training program should be conducted for aircrew and maintenance personnel to reduce failures due to by individual cell re placement. Maintenance

3

personnel error. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

SONOTONE CORP ELMSFORD N Y AD- 407 111

DESIGN AND MANUFACTURE OF SEALED NICKEL CADMIUM CELLS OF CYLINDRICAL DESIGN TO SIGNAL CORPS TECHNICAL REQUIREMENT SCL-7504A, JUNE 28,

3

DESCRIPTIVE NOTE: Final rept., 1 Dec 59-31 Mar 63 Alliegro, Francis; MAR 63 79P Allie CONTRACT: DA-36-039-SC-84496 TASK: 3G1803 001 02

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*STORAGE BATTERIES, BATTERIES, BATTERY SEPARATORS, ANDDES, CATHODES (ELECTROLYTIC, ALKALINE BATTERIES, ELECTROLYTES, SEALS, PLASTIC SEALS, CADMIUM, NICKEL, TESTS, DESIGN.

33

3 pertinent drawings of all types of cells are included partially scored to immobilize te assembly in order teflon seals and 20 cells had ceramic seals. Fifty each of the 50 A.H. and 100 A.H. calls were fully passed and all cells were delivered. All 10 A.H. and 50 A.H. cells had teflon sealed terminals. In the 100 A.H. size, 40 cells had The 60 cells of each of three sizes (10 A.H., 50 A.H. and 100 A.H.) were manufactured. The qualification tests of SCL-7504A were success to withstand the severe vibration and snock requirements of SCL-7504A. Parts lists and in this report. (Author)

UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

AD- 406 782

NAVAL RESEARCH LAB WASHINGTON D C

3 SEA WATER BATTERY PLUS JUNNEL DIODE CONVERTER AS A POWER SOURCE.

Final rept., DESCRIPTIVE NOTE:

Marzolf, J.M.; 44 MAY 63

REPT. NO. NRL-5961 PROJ: RR010-01-44-5601, SF013-06-29 2857, SR007-12-01-0800 TASK:

# UNCLASSIFIED REPORT

DESCRIPTORS: \*INVERTERS. \*TUNNEL DIODES, \*WATER ACTIVATED BATTERIES, FEASIBILITY STUDIES, BEACON LIGHTS, MAGNESIUM, GERMANIUM, BUDYS, SEA WATER. (U)

3 they have been expended, but the static converter can be re-used indefinitely. The compatibility of the magnesium-iron sea water battery and tunnel diode converter has been de monstrated as a practical power marine applications, the combination of a single cell sea water battery with a tunnel diode converter to step up the voltage is proposed. The devices should be designed for integration as a single unit for a given load and lifetime. The sacrificial anodes used in the battery can be re placed after duration, maintenance-free power source for re mote a power source for radio distress transmitters for small boats or ditched aircraft, it would be particularly at tractive because of an indefinite shelf lift. (Author) remote buoys or oceanographic instrumentation. As To fill the need for a low-power, reliable, long source. It would have applications for powering

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

AD- 406 134

GULTON INDUSTRIES INC METUCHEN N

STATE OF CHARGE INDICATORS FOR NICKEL CADMIUM BATTERIES.

3

Lurie, M.; Seierand, H. N.; Final rept. Jan 62-Jan 63, 95P DESCRIPTIVE NOTE: FEB 63

CONTRACT: AF33 657 8130 Shair, R.C.;

PROJ: 8173

**TDR63 191** 81730415 MONITOR: ASD

## UNCLASSIFIED REPORT

ESCRIPTORS: \*ALKALINE BATTERIES, ELECTRIC, ELECTRIC DISCHARGE, ELECTRICAL, MEASURING DEVICES (ELECTRICAL AND, PHASE METERS, NICKEL, CADMIUM, TEST SETS, TEST EQUIPMENT (ELECTRONICS), TEST DESCRIPTORS:

3

phase shift system is described which when proper calibrated pre dicted state of change with an average deviation of = 10%. Ohmic resistance measured THE VARIATIONS OF SEVERAL ELECTRICAL PROPERTIES OF NICKEL CADMIUM CELLS WITH STATE OF CHARGE WERE STUDIED TO DETERMINE THE SUITABILITY OF ANY OF THESE FOR MEASURING STATE OF CHARGE. Three methods were additional parameters were measured, a. c. impedance under correct conditions showed a closer correlation resistance, microsecond transients and double layer capacitance. During the investi gations two and phase hift. Double layer capacitance and a.c. impedance and transient behavior are not useful properties for determining stae of charge. A to state of charge but is difficult to measure. originally proposed: measurements of ohmic (Author)

3

UNCLASSIFIED

PAGE

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 405 904 NAVAL RESEARCH LAB WASHINGTON D C THEORETICAL DESIGN OF PRIMARY AND SECONDARY CELLS.
PART III. BATTERY DISCHARGE EQUATION, (U)

MAY 63 15P Shepherd, C.M.; REPT. NO. NRL-5908

UNCLASSIFIED REPORT

DESCRIPTORS: \*PRIMARY BATTERIES, \*STORAGE BAT, \*ELECTRIC DISCHARGES, BATTERIES AND, POLARIZATION, RESISTANCE (ELEC, ELECTRIC CURRENTS, ELECTRIC POTEN, MATHEMATICAL ANALYSIS, DENSITY, EQUATIONS. (U)

An equation was derived describing a complete battery discharge for the case when the current density distribution is uniform. The battery potential during discharge is given as a func tion of time, current density, colarization, internal resistance, and other factors. This equation will be used as a base for deriving the more general case where the current density over the face of the electrodes is uneven. This equation has a number of practical applications. It can be used to describe battery charges and discharges, capacities, power evolution, and predict capacities on the basis of limited data. The equation to applied to the charging of batteries by changing the signs of some of the terms in the equation. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL ND. ZOMO7

1- 404 861 RADIO CORP OF AMERICA SOMERVILLE N HIGH-CAPACITY MAGNESIUM BATTERIES.

3

DESCRIPTIVE NOTE: Rept. no. 10 (Final), 1 June 60-30 Nov 62,

NOV 62 1V Ryan, R.J.; Krebs, T.R.; CONTRACT: DA36 039sc85340

PROJ: 3A99 09 002

UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, \*METEOROLOGICAL, \*LOW TEMPERATURE BATTERIES, \*PRIMARY, COPPER COMPOUNDS, OXIDES, CATHODES, MERCURY COMPOUNDS, AD, ELECTRIC POTENTIAL, CONTROL, STORAGE, POLARIZATION, DIOXIDES, MANGANESE COMPOUNDS, ANODES (ELECTROLYTIC CELL), CORROSION, FILMS, ELECTRICAL CONDUCTIVITY, VISCOSITY, CONTAINERS, SEALS (STOPPERS), ELECTRICAL IMPEDANCE, EQUA, LOW TEMPERATURE RESEARCH, EFFECTIVENESS, TABLES (OATA), MAGNESIUM, MAGNESIUM COMPOUNDS, DESIGN, PERCHLORATES, ELECTROLYTES.

3

Characteristic data are presented for magne sium/
magnesium-perchlorate reserve cells dis charged at
temperatures as low as -40 F. Cathode efficiency
data as a function of temperature and current drain
are also presented. Factors affect ing the
performance of dry cell batteries were investigated.
Cathode efficiencies, storage-aracteristics, and
electrode surface phenomena were evaluated. Data
are also presented for a newly-developed magnesium/
mercuric-oxide meteor ological battery, including
discharge data for temperatures as low as -58 F.
(Author)

3

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

RADIO CORP OF AMERICA SOMERVILLE N J

ORGANIC DEPOLARIZED PRIMARY BATTERIES.

 $\hat{\Xi}$ 

DESCRIPTIVE NOTE: Final rept., 15 June 61-14 Dec 62, DEC 62 1V Eisen.J.B.;Ryan,R.J.; DEC 62 1V E CONTRACT: DA36 035C87243

PROJ: 3A99 09 002

# UNCLASSIFIED REPORT

DESCRIPTORS: .PRIMARY BATTERIES, \*ORGANIC COM, CARBON BLACK, NITRGGEN COMPOUNDS, MAGNESIUM, CATHODES (ELECTROLYTIC CELL), WET, ADSORPTION, ELECTROLYTES, OXIDES, VANADIUM COMPOUNDS, BATTERIES + COMPONENTS. (

available pure acetylene carbon black can be adapted, however, by means of an intensive mechanical opening process, especially with simultaneous introduction of electrolyte, retains a measure of structure adequate for massive material trans for and diffusion magnesium cells. The specification evolved listed compressed carbon black. These con ditions demand conductivity and a maximum volume of voids in the processes. No commercial car bon black was found A survey was made of experimental and commercial low density, large surfare area, high electrical a fluffy carbon black which, in the presence of carbon blacks for use with m-dinitrobenzene in ideally suited for this cath ode system. One a small quan tity of V205. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. 20MD7

GULTON INDUSTRIES INC METUCHEN N J

SILVER-CADMIUM BATTERY PROGRAM.

3

DESCRIPTIVE NOTE: Final rept., 23 Jan 61-1 Oct 62, MAR 63 106P Rampel ,G. ;Liska ,J. ;

Shair, R. C.; CONTRACT: AF33 600 42397

PROJ: AF-8173 TASK: 817304

TR-61-131-Pt-2 WADD MONITOR:

# UNCLASSIFIED REPORT

DESCRIPTORS: \*BATTERY COMPONENTS, \*ELECTRIC BATTERIES, \*ELEC, CADMIUM, OXIDES, BATTERY SEPARATORS, NYLON, TESTS, TEMPERATURE, ELECTRIC CURRENTS, ELECTRIC POTENTIAL, ELECTROLYTES, PRESSURE, DEGRADATION, ACCELERATION, VIBRATION, IMPACT, PICTURES, TABLES(DATA), SILVER.

3 improved, long life, sealed silver-cadmium bat teries for aerospace applications is discussed. A silver electrode was utilized which yielded up to 50% of its capacity at the AgII oxide voltage plateau and the balance at the AgI oxide voltage plateau. hour cells, the AG-7HS, were life tested in a 90 minute cycle at several depths of discharge and at several temperatures, utilizing constant current and constant voltage recharge methods. Three thousand Charging problems are discussed. It was found that a charge routine consisting of a combination of constant current followed by constant potential was separator combination consisted of single layers of Several separator systems were tested with regard better than constant current charging or constant Sausage casing – V, each enclosing the nositive electrodes in the order listed. Sixty 7 ampere-A research and development program leading to cycles were achieved at a 17% depth at 78 F. Dynel-Polypor WA (coarse nylon base)-Fibrous to obtaining maximum cycle life. The best Potential charging alone. (Author)

PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

AD- 402 884

RADIO CORP OF AMERICA SOMERVILLE N J

INVESTIGATION OF NEW CALHODE-ANDDE COUPLES FOR SECONDARY BATTERIES USING MOLTEN SALT ELECTROLYTES.

Uhler, E. F.; Stockdale, G.; DESCRIPTIVE NOTE: Final rept. Nov 61-Nov 62, Ritterman, P.: Lozier, G.S.;

CONTRACT: AF33 657 7758 PROJ:

817304

TDR63 115 MONITOR: ASD

# UNCLASSIFIED REPORT

3 FLUORIDES, CHLORIDES, SULFATES, CERAMIC MATERIALS, CATHODES (ELEC, ANDDES (ELECTROLYTIC CELL), SELECTION, COUPLING CIRCUITELIING, BATTERIES AND COMPONENTS, \*STORAGE BATTERIES, THEORY, ELEC, SALTS, DESCRIPTORS: MATERIALS

3 experimental results for the molten-salt continuestigated are presented. Data are presented for cells with fluoride, chloride and sulfate molten-salt electrolyte. Objectives and results of a ceramic described, along with abrication procedures of this approach in selecting the most promising materials for the development of higher capacity secondary batteries for space applications is reported. The The design of a molten-salt secondary battery which was constructed during the course of the program is heat input versus heat output and the heat loss due precautions required in molten salt technology are An investigation of the most direct and systematic separator study phase of the program are included. various molten sait elec trolytes considered are battery. Theoretical calculation for the initial experimental approach, materials, and necessary summarized. Advantages and disadvantages of the presented. Experimental procedures and couple materials investigated are discussed. The to cell radiation is presented. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO AD- 402 461

HEAT AND POWER ENGINEERING (SELECTED ARTICLES

3

REPT. NO. FTD-TT-62-1656 62P

3

# UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Translated from Teploenergetika, No. 3, p100-107, 116-128, 137-163, 1961.

DESCRIPTORS: \*BATTERY COMPONENTS, \*ELECTRIC BATTERIES, \*EARPHONES, \*PHOTOELECTRIC CELLS (SEMICONDUCTOR), \*REFLECTORS, ALLOYS, BORON, CHEMICAL MILLING, CRYSTALS, DIFFUSION, ELECTRIC CORRENTS, ELECTRIC POTENTIAL, ELECTRICAL PRODERTIES, HALL EFFECT, IMPURITIES, OPTICAL TRACKING, PHOSPHORUS, PHOTOELECTRIC MATERIALS, RECOMBINATION REACTIONS, SILICON, SOLAR CELLS, SOLAR PANELS, SURFACE PROPERTIES

IMPURITY DISTRIBUTION IN ALLOYED LAYER OF PHOTOELECTRIC CONVERTERS. STUDY OF USING POLYCRYSTALLINE SILICON TO MAKE PHOTOELECTRIC CONVERTERS. DESIGNS AND ELECTRICAL CHARACTERISTICS OF SILICON PHOTOELECTRIC CONVERTER BATTERIES. HIGH CONCENTRATIONS OF SOLAR ENERGY IN SILICON PHOTOELECTRIC CELLS. SOLAR PHOTOELECTRIC BATTERY REFLECTORS.

UNCLASSIFIED

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SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

GENERAL MOTORS CORP KOKOMO IND DELCO RADIO DIV SILVER-ZINC SECONDARY BATTERY INVESTIGATION

LANDER, J. J. ; KERALLA, J. A.; CONTRACT: AF33 657 8943

# UNCLASSIFIED REPORT

SUPPLIES. \*SIGRAGE BATTERIES. ADDITIVES. ELECTRIC CURRENTS. ELECTRIC CURRENTS. ELECTRIC DISCHARGES, ELECTROCHEMISTRY, ELECTRODES. HYDROXIDES. LIFE EXPECTANCY, MATERIALS. MERCURY COMPOUNDS. SILVER, SILVER ALLOYS, SPACECRAF(U)

SILVER-ZINC SECONDARY BATTERY INVESTIGATION.

PALLADIUM ADDITIONS TO SILVER PLATE. SILVER PARTICLE SIZE
EFFECTS ON CAPACITY AND CYCLE LIFE. CURRENT DENSITY AND
KOH CONCENTRATIONS ON C'ULE LIFE. EXPANDER AND H EVOLUTION
STUDIES ON THE NEGATIVE PLATE.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

NEW CATHODE-ANDDE COUPLES USING NONAQUEDUS ELECTROLYTE

3

3

BAUMAN, H.G.; CHILTON, J.E.; COOK, G.M.;

CONTRACT: AF33 616 7957

## UNCLASSIFIED REPORT

DESCRIPTORS: \*BATTERY COMPONENTS, \*ELECTRIC BATTERIES,
ANODES (ELECTROLYTIC CELL), CATHODES (ELECTROLYTIC
CELL), CHLORIDES, DESIGN, ELECTROCHEMISTRY, ELECTRODES,
ELECTROLYTES, ELECTROLYTIC CELLS, GRAPHITE, LITHIUM,
OXIDATION, SILVER, SILVER COMPOUNDS. TESTS, THICKNESS (U)

PROGRESS REPORT: NEW CATHODE-ANODE COUPLES USING NON-AQUEOUS ELECTROLYTE.

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 401 721

INLAND TESTING LABS DAYTON OHIO

INVESTIGATIONS LEADING TO THE DEVELOPMENT OF THE OPTIMUM METHOD(S) FOR CHARGING SEALED NICKEL-CADMIUM BATTERIES (U)

DEC 62 1V LUKE,I.F.;KDESTERS,R.L.; CONTRACT: DA36 039SC90823

UNCLASSIFIED REPORT

DESCRIPTORS: \*BATTERY COMPONENTS, \*ELECTRIC BATTERIES,
CADMIUM, CADMIUM ALLOYS, DESIGN, ELECTRIC CURRENTS,
ELECTRICAL PROPERTIES, EXPERIMENTAL DATA, MATHEMATICAL
ALALYSIS, NICKEL, NICKEL, ALLOYS, PROCESSING,
TEMPERATURE, TESTS, TIME
IDENTIFIERS: NICKEL CADMIUM BATTERIES
(W)

OPTIMUM METHODS FOR CHARGING SEALED NICKEL+ CADMIUM BATTERIES; PROGRESS REPOFT NO. 1.

#### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MO7

D- 401 553 DOW CHEMICAL CO MIDLAND MICH

INVESTIGATION OF THE MAGNESIUM ANDDE

3

JAN 63 1V ROBINSON, J.L.; CONTRACT: DA36 039SC89082

UA36 0395C89082

UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, \*PRIMARY BATTERIES, BATTERY COMPONENTS, ELECTRIC BATTERIES, CHLORIDES, CORROSION, ELECTRIC DISCHARGES, ELECTRIC POTENTIAL, ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, MAGNESIUM, MAGNESIUM COMPOUNDS, PERCHLORATES

MAGNESIUM ANODE. ELECTROCHEMISTRY INVOLVED IN ITS USE IN PRIMARY BATTERY SYSTEMS.

PAGE

AD- 401 359

MALLORY (P R) AND CO INC INDIANAPOLIS IND

CELL EQUALIZATION TECHNIQUES

(U)

APR 63 1V LOFTUS.W.D.; CONTRACT: AF33 657 8749

UNCLASSIFIED REPORT

DESCRIPTORS: \*ALKALINE BATTERIES, \*SPACECRAFT, BATTERY COMPONENTS, ELECTRIC BATTERIES, CADMIUM, CIRCUITS, ELECTROTHERAPY, EXPERIMENTAL DATA, GERMANIUM, GOLD, NICKEL, POWER SUPPLIES, RELIABILITY, SEMICONDUCTORS, (U)

PROGRESS REPORT: CELL EQUILIZATION AND ANTICELL REVERSAL TECHNIQUES FOR SECONDARY BATTERIES.

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO?

AD- 298 942 LITTLE (ARTHUR D) INC CAMBRIDGE MASS LOW TEMPERATURE OPERATION OF BATTERIES

3

NDV 62 1V HORNE, R.A.; BLACK, I.A.; CONTRACT: DA36 039SC90706

UNCLASSIFIED REPORT

DESCRIPTORS: \*BATTERY COMPONENTS, \*ELECTRIC BATTERIES, \*THERMAL INSULATION, EFFECTIVENESS, ELECTROCHEMISTRY, EXPERIMENTAL DATA, HEAT TRANSFER, HEATING, LOW TEMPERATURE RESEARCH, POLAR REGIONS, POWER SUPPLIES, STYRENE PLASTICS, TABLES(DATA)

LOW TEMPERATURE OPERATION OF BATTERIES

PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

298 568

EAGLE-PICHER CO JOPLIN MO

3 INVESTIGATIONS LEADING TO THE DESIGN OF A RELIABLE SEALED NICKEL-CADMIUM CELL

OCT 62 1V CUPP, E.B.; CONTRACT: DA36 0395C89084

UNCLASSIFIED REPORT

3 DESCRIPTORS: \*ALKALINE BATTERIES, \*ELECTROLYTIC CELLS, \*STORAGE BATTERIES, ADD:TIVES, CADMIUM, DESIGN, EFFECTIVENESS, ELECTRODES, ELECTROLYTES, EXPERIMENTAL DATA, HYDROXIDES, LITHIUM COMPOUNDS, MERCURY ALLO'S, NICKEL, POLARIZATION, POTASSIUM COMPOUNDS, SEALS (STOPPERS)

RESULTS OF AN INVESTIGATION OF PLATE PARAMETERS AND ELECTROLYTE CHARACTERISTICS OF NICKELCADMIUM CELLS OF A THREE-PLATE SIGN.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIGGRAPHY

AD- 298 170 FRANKFORD ARSENAL PHILADELPHIA PA

PORTABLE LASER RANGEFINDER; BATTERY SELECTION CRITERIA

3

DESCRIPTIVE NOTE: Test rept.,
JAN 63 13P LEHMAN, JOSEPH T.;
REPT. NO. FA-T63-6-1
PROJ: DA-51307010

UNCLASSIFIED REPORT

3 DESCRIPTORS: \*BATTERY COMPONENTS, \*ELECTRIC BATTERIES LASERS, PORTABLE (MAN-PORTABLE), RANGE FINDING SUPPLEMENTARY NOTE: See also Supplement dated Oct 63, AD-425 850.

PORTABLE LASER RANGEFINDER; BATTERY SELECTION CRITERIA.

UNCLASSIFIED

341

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

UNION CARBIDE CONSUMER PRODUCTS CO CLEVELAND OHIO AD- 297 527

ALKALINE-MNO2 BATTERY

WINGER, J.; DOLL, P.B.; DA-36-039-sc-89098 2

3A99-09-002-02

## UNCLASSIFIED REPORT

DESCRIPTORS: \*ALKALINE BATTERIES, \*ELECTROLYTIC CELLS, \*STORAGE BATTERIES, ANALYSIS, DENSITY, DESIGN, DIOXIDES, EFFECTIVENESS, ELECTRIC CURRENTS, ELECTRODES, ELECTROLYTES, EXPERIMENTAL DATA, HYDROXIDES, LOW TEMPERATURE RESEARCH, MANGANESE COMPOUNDS, POLARIZATION, ANALYSISM SCHIM SCHADOLINDS

AN INVESTIGATION OF 228 CATHODE MIX IN ALKALINE-MNO2 Battery.

### UNCLASSIFIED

ZOMO2 SEARCH CONTROL NO. DDC REPORT BIBLIDGRAPHY

296 906

MALLORY (P R) AND CO INC INDIANAPOLIS IND

MERCURY CELL BATTERY INVESTIGATION

3

3

BODE, J.M.; RALSTON, R. E.; 53 1V AF33 657 7706 63 CONTRACT: NAD

TDR62 1112 MONITOR:

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*ELECTRIC POWER PRODUCTION, \*POWER SUPPLIES, \*STORAGE BATTERIES, ALKALINE BATTERIES, BATTERY SEPARATORS, DESIGN. ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, MYDROXIDES, MATERIALS, MERCURY SPACECRAFT

A comprehensive study of separator materials was made. Positive electrode densification experienced during cycle testing appears to be related to cycle depth. Use of Pd in the positive electrode alloy improved charge efficiency. (Author) exploratory research cell, with accompanying pellet type reference electrode, were successfully used during positive and negative electrode chargedischarge experiments. In anodes containing high percentages of Hg were discharged with efficiencies over 90% at rates up to 2000 ma/sq. in. under uninhibited conditions. The system of In-Hg-Ag was found compatible with electrolyte containing completed cells. Discharge utilization obtained was comparable to that obtained in the research cell. zincate. A cell cup retaining member for the high The rechargeable electrochemical system Zn/KOH, HgO-Ag was investigated from the viewpoint of aerospace requirements. Two versions of an Hg-Zn alloy was fabricated and employed in

3

PAGE

AD- 296 906

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 296 894

CALVIN COLL GRAND RAPIDS MICH

SILVER MIGRATION AND TRANSPORT MECHANISM STUDIES IN SILVER OXIDE-ZING BATTERIES

DIRKSE, T. P. : LUGT, A. VANDER CONTRACT: AF33 65' 8689

UNCLASSIFIED REPORT

SEPARATORS: \*ALKALINE BATTERIES, \*SILVER, BATTERY SEPARATORS, ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, HYDROXIDES, MATERIALS, OXIDES, POTASSIUM COMPOUNDS, QUANTITATIVE ANALYSIS, SILVER COMPOUNDS, SOLUBILITY, TORSION BARS

3 Good results were obtained by precipitating the dissolved silver as silver iodide and collecting this on a filter paper of sufficiently small pore size. The precipitated silver iodide was then counted. quantitatively the concentration of small amounts of silver dissolved in potassium hydroxide solutions. A study was made of three methods whereby radioactive silver can be used to determine

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 295 983

EAGLE-PICHER CO JOPLIN MO

RESEARCH ON AMMONIA BATTERY SYSTEM

3

2

DOAN, D. J. : WOOD , L. R. ; CONTRACT: DA36 0395C89188

UNCLASSIFIED REPORT

3 DESCRIPTORS: \*AMMONIA, \*ELECTROLYTES, \*ELECTROLYTIC
CELLS, \*POWER SUPPLIES, \*PRIMARY BATTERIES, \*WET CELLS,
ANDDES (ELECTROLYTIC CELL), BATTERY SEPARATORS, CATHODES
(ELECTROLYTIC CELL), CHEMICAL PROPERTIES, CHLORIDES,
DESIGN, EFFECTIVENESS, ELECTRIC DISCHARGES. ELECTRICAL
IMPEDANCE, HYDROGEN, LIQUEFIED GASES, MAGNESIUM
COMPOUNDS, MERCURY COMPOUNDS, PERCHLORATES, POTASSIUM
COMPOUNDS, SILVER COMPOUNDS, SULFATES, THIOCYANATES (U

3 separator has been found much better than cellophane for limiting the silver diffusion in the low-rate, factors contributing to the previously observed slower practical activation of the -53 C batteries as compared to single cells under ideal conditions. Tests indicate a larger percentage of the batteries activate in less than 3 seconds, with several about second. A new high-rate cathode possibility (silver sulfate) has been found. Permion 300 A better understanding has been obtained of the ong duration application. (Author)

PAGE

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 295 976
UNION CARBIDE CONSUMER PRODUCTS CO CLEVELAND OHIO

ALKALINE-MNO2 BATTERY

3

AUG 62 1V WINGER, J.; CONTRACT: DA36 0395C89098

UNCLASSIFIED REPORT

DESCRIPTORS: \*ELECTROLYTIC CELLS, \*PRIMARY BATTERIES,
\*WET CELLS, ANODES (ELECTROLYTIC CELL), BATTERY
SEPARATORS, CATHODES (ELECTROLYTIC CELL), DEGRADATION,
DESIGN, EFFECTIVENESS, ELECTRODES, ELECTROLYTES,
GRAPHITE, HYDROXIDES, LOW TEMPERATURE RESEARCH,
POLARIZATION, POLYMERS, POTASSIUM COMPOUNDS, STORAGE,
VINYL PLASTICS, ZINC
OUNTLIFIERS: VINYON
(M.

The initial effort to analyze the present factory product E-95 (D size) 'lkaline-MnO2 round cell with special emphasis placed on location of problem areas affecting low temperature, heavy drain service. Empirical data was obtained from variations of electrode and electrolyte formulations as well as separator materials. An optimized cell contains a cathode with a 4/1 one to carbon ratio, an electrolyte with 40% KDH as dispensed into the cell (approximately 32% equilibrium value in the anolyte), a ViskonVinyon separator and a powdered zinc anode. The work to date has indicated a need for a higher surface area zinc. Uniformity of cathode mix formulations will also be characterized with respect to solution volumes, (U)

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 294 358 GENERAL MOTORS CORP KOKOMO IND DELCO RADIO DIV SILVER ZINC SECONDARY BATTERY INVESTIGATION

3

JAN 63 1V LANDER, J.J.: KERALLA, J.A.: CONTRACT: AF33 657 8943

# UNCLASSIFIED REPORT

DESCRIPTORS: \*ALKALINE BATTERIES, \*ELECTROLYTIC CELLS, \*SILVER, \*STORAGE BATTERIES, \*ZINC, ABSORPTION, BATTERY SEPARATORS, ELECTRIC POTENTIAL, ELECTROLYTES, ETHYLENES, HYDROGEN, HYDROXIDES, IMPREGNATION, OXIDES, PALLADIUM, PALLADIUM COMPOUNDS, POLYMERS, POTASSIUM COMPOUNDS, SALTS, VINYL ALCOHOL, ZINC COMPOUNDS

AG-ZN SECONDARY BATTERIES: ABSORPTION OF H2 BY PD-TREATED AG POSITIVE PLATES; CURRENT DENSITY AND KOH STUDIES ON CYCLE LIFE; EXPANDER STUDIES AND H2 EVOLUTION STUDIES.

PAGE

SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

ELECTRIC STORAGE BATTEPY CO MADISON WIS RAY-0-VAC DIV

3 LOW TEMPERATURE BA-2270/U-XLT-1 BATTERIES

PAULSON, J.W.;

UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, \*LOW TEMPERATURE BATTERIES, \*POWER SUPPLIES, \*STORAGE BATTERIES, BATTERY SEPARATORS, BROMIDES, CHLORIDES, CORROSION, DIOXIDES, ELECTRIC DISCHARGES, ELECTRODES, ELECTROLYTES, FAILURE (MECHANICS), INDUSTRIAL PLANTS, LITHIUM COMPOUNDS, LOW TEMPERATURE RESEARCH, MANGANESE COMPOUNDS, PRODUCTION, SEALS (STOPPERS), STORAGE, TESTS, ZINC

3 for Signal Corps testing and approval. Five hundred production batteries were then constructed of which 310 were in-plant tested and 190 submitted to Facilities for producing flat cell type BA2270/U-XLT-1 batteries at a pilot line level were activated. Fifty preproduction batteries were made performance results, up to and including 24 months electrolyte leakage are discussed along with their delay, are reported for the BA-2270/U battery of a flat cell construction. Discharge testing was conducted at +70, -20 and -40 F. Problems of the Signal Corps for testing. In-plant effect on performance. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMD7 DUC REPORT BIBLIOGRAPHY

MONSANTO RESEARCH CORP EVERETT MASS

RESEARCH ON ORGANIC DEPOLARIZERS

GRUBER, BERNARD A.; MCELHILL, ELIZABETH ? 62

MRB 4006 Q5 DA36 039SC87336 REPT. NO.

CONTRACT:

# UNCLASSIFIED REPORT

33 DESCRIPTORS: \*ELECTROLYTIC CELLS, \*ORGANIC COMPOUNDS, \*PRIMARY BATTERIES, AMMONIUM COMPOUNDS, BROWIDES, BUTYL RADICALS, CARBOXYLIC ACIDS, CATHODES (ELECTROLYTIC CELL), CHLORIDES, HYPOCHLORITES, MAGNESIUM COMPOUNDS, NITRO RADICALS, NITROBENZENES, GAMIUM COMPOUNDS, OXIDES, PERCHLORATES, PEROXIDES, PHIMALIC ACIDS, POLARIZATION, PYRIDINES, PYRAOLES, QUINOLINES, SILYER COMPOUNDS, SODIUM COMPOUNDS, SYNTHESIS, TEST DENTIFIERS: BUTYL RADICALS, NITRO RADICALS

EVALUATION OF ORGANIC DEPOLARIZERS FOR PRIMARY BATTERIES TO DEVELOP BATTERIES WITH HIGHER VOLTAGES AND CAPACITIES THAN THE PRESENT MG/MGBR2-METADINITROBENZENE SYSTEMS.

AD- 293 255

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

DOW METAL PRODUCTS CO MIDLAND MICH

INVESTIGATION OF THE MAGNESIUM ANDDE

3

ROBINSON, J. L.; 2

DA36 0355C89082 CONTRACT:

# UNCLASSIFIED REPORT

DESCRIPTORS: \*ELECTRODES, \*PRIMARY BATTERIES, ELECTROCHEMISTRY, ELECTROLYTES, ORGANIC ACIDS, SALTS

DENTIFIERS: ORGANIC ACIDS

33

3 A221X1 anodes to approach a steady state of returned the application of 45 milliamperes per square inch of ED FOR ELECTROLYTE WITH MAGNESIUM DRY CELLS
PROVIDING THE ACID S RUCTURE CONTAINS NO MORE THAN
FOUR METHYLENE GROUPS. Salts of aromatic acids
having two or more carboxyls can be considered for
electrolytes for magnesium primary cells. Mixed
perchlorate and organicACIDS ALTS SHOW SOME PROMISE
FOR ELECTROLYTES. More detail of the nodic
polarization curve for magnesium with magnesium ace measurements. It took at least twenty minutes for at electrolyte was obtained with potentiostatic measurements as opposed to galvanostatic current. (Author)

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

RADIO CORP OF AMERICA SOMERVILLE N J

ORGANIC DEPOLARIZED PRIMARY BATTERIES

3

LOZIER, G.S.; EISEN, J. BB.; 2 SEP 62

UNCLASSIFIED REPORT

DESCRIPTORS: \*CARBON BLACK, \*CATHODES (ELECTROLYTIC CELL), \*PRIMARY BATTERIES, \*WET CELLS, BROMIDES, ELECTRICAL CONDUCTIVITY, ELECTROLYTES, IRON, MAGNESIUM, MAGNESIUM COMPOUNDS, NICKEL, NITROBENZENES, OXIDES, PERCHLORATES, STORAGE, TIN, VANADIUM, ZIPCONIUM COMPOUNDS

suitable for use with m-dinitrobenzene is given. The more efficient reduction of aromatic nitro A tentative specification for a carbon black

groups by certain metals is examined. Electroless nickel solutions did not deposit nickel on Columbian HR-1670 carbon black. The low solubility of m-dinitrobenzene in water is changed only slightly by MgBr2, but is affected more by Mg(C1104)2 and, especially, by reduction products of m-dinitrobenzene. A new titration method for measuring pore volume was tried and found

WEDDINDS, DRIDES, RESCHEDNIES, REROXIDES, O

unsuitable with carbon blacks. (Author)

AD- 292 907

EFECIATO ZIONVOE RVIJELA CO SVOLZOM MIZ SVA-O-AVO DIA

SECHIDES CHICHIOFE C \*\*\*DOMED CHICHIOFE C \*\*\*DOMED SUPPLIES \*\*\*\*LON

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 291 715

RADIO CORP OF AMERICA SOMERVILLE N J

HIGH-CAPACITY MAGNESIUM BATTERIES

3

AUG 62 1V LOZIER.G.S.;RYAN,R.J.;KREBS,T.R.; CONTRACT: DA 36-039-SC-85340 PROJ: 3A99-09002

# UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, \*LOW TEMPERATURE BATTERIES, \*MAGNESIUM, \*MAGNESIUM COMPOUNDS, CATHODES (ELECTROLYTIC CELL), DIOXIDES, ELECTRODES, ELECTTOLYTIC CELLS, EXPERIMENTAL DATA, MANGANESE CO" ANDS, MANUFACTURING, PERCHLORATES, PRIMARY BATTERIES, TEMPERATURE (U)

DATA ON MG/MG(CLO4)2 RESERVE CELLS AT LOW TEMPERATURES (-40F).

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

DEVELOPMENT OF SEALED SILVER OXIDE-ZINC SECONDARY BATTERIES GENERAL MOTORS CORP ANDERSON IND DELCO-REMY DIV

3

LANDER, J.J.; KERALLA, J.A.; REPT. NO. TDR62 668 CONTRACT: AF33 600 41600 MONITOR: ASD

TDR62 668

# UNCLASSIFIED REPORT

DESCRIPTORS: \*SILVER COMPOUNDS, \*STORAGE BATTERIES, ELECTRODES, OXIDES, SATELLITES (ARTIFICIAL), SEALS (STOPPERS), SILVER, TESTS, ZINC

3

Eighty-nine cells were cycled to failure.
Batteries were designed, constructed and life cycle tested. Twelve batteries were cycled to failure; one additional battery was tested environmentally. (Author) A research and development program has been carried out with the objective of providing an hermetically sealed silver oxide-zinc battery for use in satellite abplications. The following basic problem areas were studied: (1) silver migration in the cell; (2) battery voltage regulation; (3) zinc particle size and displacement during cycling; (4) gas evolution; and (5) terminal sealing. Sealed cells were designed, constructed, and testid electrically and environmentally.

3

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 291 171
UNION CARBIDE CONSUMER PRODUCTS CO CLEVELAND OHIO

INDUSTRIAL PREPAREDNESS STUDY OF SYNTHETIC MANGANESE DIOXIDE IN MASS PRODUCTION OF MILITARY DRY BATTERIES (U)

NDV 61 1V BISHOP, H.K.: CONTRACT: DA36 0395C75946

UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, \*MANGANESE COMPOUNDS, CAPACITANCE, DIOXIDES, ELECTRIC POTENTIAL, FILMS, HUMIDITY, MANUFACTURING, MILITARY REQUIREMENTS, MIXTURES, POLARIZATION, PREPARATION, PRODUCTION, STORAGE, TESTS

EVALUATION TESTS ON BA-30, BA-270/U, AND BA-279/U, MNO2 TYPE DRY CELL BATTERIES FOR THEIR ABILITY TO MEET MIL-8-186 REQUIREMENTS; PEPOLARIZATION MIXES.

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 290 618

IIT RESEARCH INST CHICAGO ILL

CHEMICAL CONVERSION OF WASTE HEAT TO ELECTRICAL ENERGY

3

JUN 62 40P MCCULLY, C. ROLAND: PT. NO. 3182 9

REPT. NO. 3182 9 CONTRACT: NOW-60-0760

# UNCLASSIFIED REPORT

DESCRIPTORS: \*ELECTRICITY, \*ELECTROLYTIC CELLS, \*POWER SUPPLIES, \*PRIMARY BATTERIES, ADDITIVES, ALUMINUM COMPOUNDS, ANODES (ELECTROLYTIC CELL), ANTIMONY COMPOUNDS, ARSENIC COMPOUNDS, BATTERY SEPARATORS, CATHODES (ELECTROLYTIC CELL), CHEMICAL REACTIONS, CHLORIDES, COPPER COMPOUNDS, ELECTRICAL CONDUCTIVITY, ELECTROLYTES, EUTECTICS, GLASS TEXTILES, LEAD COMPOUNDS, MELTING, POTASSIUM COMPOUNDS, PYROLYSIS, SODIUM COMPOUNDS, SOLIDS, TELLURIUM COMPOUNDS, THALLIUM (U)

3

Development of the chemical method of converting heat to electrical energy is reported. Parallel development of systems based on the Cu-Te Chlorides and Sb chlorides has continued. The former system has afforded the more favorable galvanic cell characteristics. Although this system is technically feasible, practical regeneration of the anode liquid has not been achieved because of complications in separating the resulting TeCl2 and Cl2 gases at the regeneration temperatures. Separation as a result of the selective solubility of TeCl2 in a molten carrier salt gives bromise of becoming practical, but at present the solubility of 1-3% is below the 20% solubility deemed necessary. The principal effort with the SbCl3 system has been to obtain satisfactory galvanic cells characteristics, a problem that originates with the very low ionic conductivities of the Sb chlorides. Specific conductivities of the Sb chlorides. Specific conductivities of the Sb chloride and anode systems, respectively. A solid ionic electrolyte based on PbCl2 doped with KCl has been developed to a degree satisfactory for the Sb chloride system. (Author)

PAGE

3

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLICGRAPHY

ATOMICS INTERNATIONAL CANDGA PARK CALIF

MCKISSON, R. L.; AF19 604 6168 62 7425R11 1 REPT. NO.

.2 742 AFCRL MONITOR: UNCLASSIFIED REPORT

DESCRIPTORS: \*ELECTROCHEMISTRY, \*STORAGE BATTERIES,
ANODES (ELECTROLYTIC CELL), CATHODES (ELECTROLYTIC
CELL), ELECTRODES. ELECTROLYSIS, ELECTROLYTES,
FORMAMIDES, IONS, LITHIUM, METHYL RADICALS, ORGANIC
SOLVENTS, OXIDATION REDUCTIONS, PLASTICS,
POLAROGRAPHIC ANALYSIS, POLYMERS, QUINONES, SULFOXIDE(U)
(M)

NOVEL LIGHTWEIGHT SECONDARY BATTERY SYSTEM: LI-LI ION COUPLE ANODE; ELECTRON EXCHANGE RESIN CATHODE.

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

289 541

GULTON INDUSTRIES INC METUCHEN N J

STATE OF CHARGE INDICATORS FOR ALKALINE BATTERIES

3

LURIE, M. ; SEIGER, H.N. ; CONTRACT: AF33 657 8130 ? NOV 62

### UNCLASSIFIED REPORT

3 DESCRIPTORS: \*ALKALINE BATTERIES, \*CAPACITANCE, \*PHASE MEASUREMENT, CADMIUM. ELECTRIC CURRENTS, ELECTRIC DISCHARGES, ELECTRONIC EQUIPMENT, ELECTRONIC SWITCHES, NICKEL, PHASE METERS, PHASE SHIFT CIRCUITS, RESISTANCE (ELECTRICAL)

3 A system was developed to measure the residual capacity of Nickel-Cadmium batteries by measuring the phase shift produced by the cell. The system was calibrated for three sizes of batteries. An average deviation of 19% is reported for manually cycled batteries. Results of the first stages of tests on batteries with various histories are given. Data is presented indicatingA HIGH CORRELATION BETWEEN RESIDUAL CAPACITY AND RESISTANCE MEASURED DURING A SHORT HIGH CURRENT PULSE. A device was designed to measure resistance during the first few msec. Of a pulse of several hundred amperes. This device will provide a means of measuring current when a load of about 1/2 milliohm is connected across cell for a short time. (Author)

UNCLASSIFIED

SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

AD- 289 330

MALLORY BATTERY CO TARRYTOWN N Y

3 TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND BATTERIES

JUL 62 1V GOODMAN, ROGER; CONTRACT: DA36 039SC78320

UNCLASSIFIED REPORT

DESCRIPTORS: \*ALKALINE BATTERIES, \*PRIMATES, DRY BATTERIES, ELECTRIC POTENTIAL, MERCURY COMPOUNDS, OXIDES, STORAGE, TEMPERATURE, TESTS, ZINC (U)

TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND BATTERIES OF THE ZN-ALKALINE-MERCURIC OXIDE SYSTEM UNDER VARIOUS DISCHARGE RATES, TEMPERATURE AND STORAGE TIMES.

### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

AD- 289 116 RADIO CORP OF AMERICA SOMERVILLE

HIGH-CAPACITY MAGESIUM BATTERIES

3

FEB 62 38P LOZIER, G.S.:RYAN, R.J.: CONTRACT: DA-36-039-SC-85340

PROJ: 3499-09-002

UNCLASSIFIED REPORT

3 DESCRIFTORS: \*DRY BATTERIES, \*MAGNESIUM, \*PERCHLORATES, \*PRIMARY BATTERIES, ELECTROLYTES, LOW TEMPERATURE BATTERIES, MERCURY COMPOUNDS, STORAGE

THE DEVELOPMENT OF HIGH-CAPACITY MAGNESIUM PRIMARY BATTERIES USING THE PERCHLORATE ELECTROLYTE SYSTEMS.

UNCLASSIFIED

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AD- 289 115

UNCLASSIFIED

ZOM02

AD- 289 330

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

AD- 289 062

CALVIN COLL GRAND RAPIDS MICH

3 SILVER MIGRATION AND TRANSPORT MECHANISM STUDIES IN SILVER OXIDE-ZINC BATTERIES

DIRKSE, T. P. ; LUGT, L.A. VANDER; CONTRACT: AF33 657 8689

## UNCLASSIFIED REPORT

ACRYCONITRILE POLYMERS, AMIDES, CELLULOSE, CELLULOSE ACETATES, ELECTRODES, ELECTROLYTES, ESTERS, ETHYLENES, HYDROXIDES, OXIDES, POLYMERS, POTASSIUM COMPOUNDS, SILVER, SILVER COMPOUNDS, SOLUBILITY, TRACER STUDIES, TRANSPORT PROPERTIES, ZINC \*ALKALINE BATTERIES, \*BATTERY SEPARATORS, DESCRIPTORS:

reaction towards silver oxide dissolved in potassium hydroxide solutions. Of these, the polyethylenes appear to have most promise as separator materials. Several attempts were made to trace the migration difficulty encountered in this study is the take-up obscured the interpretation of the results obtained of radioactive s:lver by the electrodes. This has of silver in a silvercadmium cell by the use of radioactive silver. A method of counting the radioactivity is being developed. The main to date. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DUC REPORT BIBLIOGRAPHY

LITTLE (ARTHUR D) INC CAMBRIDGE MASS AD- 288 801

LOW TEMPERATURE OPERATION OF BATTERIES

3

HORNE, R. A.; BLACK, I.A.; 62

CONTRACT: DA36 039SC90706

# UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, \*ELECTROLYTIC CELLS, CHEMICAL REACTIONS, ELECTROCHEMISTRY, ELECTROLYTES, HEAT OF FORMATION, LOW TEMPERATURE BATTERIES, LOW TEMPERATURE RESEARCH, TEMPERATURE, THERMAL INSULATION DESCRIPTORS:

EFFECTS OF TEMPERATURE ON THE OPERATING CHARACTERISTICS, CAPACITY, POTENTIAL AND CURRENT OF ELECTROCHEMICAL CELLS.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 288 794

BURGESS BATTERY CO FREEPORT ILL

BATTERY, WATER ACTIVATED BA-( )/U (DEVELOPMENT MODEL)

3

MAR 62 1" LOVERUDE, T.H.; CONTRACT: DA36 0395C88908

UNCLASSIFIED REPORT

DESCRIPTORS: \*STORAGE BATTERIES, \*WATER ACTIVATED BATTERIES, \*WET CELLS, CHLORIDES, COPPER COMPOUNDS, DESIGN, MANGANESE COMPOUNDS, MANUFACTURING, PREPARATI(U)

BATTERY, WATER ACTIVATED BA-( )/11 (DEVELOPMENT MODEL).

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 288 701 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

TUREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO
IMPROVEMENT OF CERTAIN OPERATIONAL CHARACTERISTICS OF
SILVER-ZINC STORAGE BATTERIES
(U)

JUN 62 1V ROMANOV, V.V.; REPT. NO. TT 61 272

UNCLASSIFIED REPORT

DESCRIPTORS: \*ELECTRODES, \*SILVER, \*STORAGE BATTERIES, \*WET CELLS, \*ZINC, ELECTROLYTES (U)

IMPROVEMENT OF CERTAIN OPERATIONAL CHARACTERISTICS OF SILVER-ZINC STORAGE BATTERIES.

PAGE

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO AD- 288 700

3 SMALL HERMETICALLY-SEALED NICKEL-CADMIUM STORAGE BATTERIES

DASOYAN, M. A.;

62 858 AFCRL MONITOR: UNCLASSIFIED REPORT

3 DESCRIPTORS: \*CADMIUM, 'NICKEL, \*STORAGE BATTERIES, ELECTRODES, NICKEL COMPOUNDS, OXIDES

SMALL HERMETICALLY-SEALED NICKEL-CADMIUM STORAGE BATTERIES.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 288 531

BUREAU OF NAVAL WEAPONS WASHINGTON D C

FEASIBILITY STUDY OF RESERVE LIQUID AMMONIA BATTERIES FOR GUIDED MISSILE FUZING

SPINDLER, WILLIAM C .: 2 62 >ON

MONITOR: NAVWEPS

7240

UNCLASSIFIED REPORT

DESCRIPTORS: \*GUIDED MISSILE BATTERIES, \*PRIMARY BATTERIES, AMMONIA, ELECTROCHEMISTRY, ELECTROLYTES, FEASIBILITY STUDIES, GUIDED MISSILE FUZES, LIQUEFIED GASES, POWER SUPPLIES

promising; however, much work must be done before complete batteries will have been evaluated under all A liquid NH3 battery is being developed to estimate its feasibility for short-life, reserve, primary applications. Specifications require three outputs (1.5 v at 0.5 amp, 150 v at 0.02 amp, and -30 v at 0.02 amp); activation time, less than 1 sec; life, greater than 2 min at 15.7% voltage regulation; storage and operating temperature range, -55 to 75 C; and size, less than 6 cu in. All critical component, an electrically initiated gas generator, is still to be developed to complete the easily be achieved within the available space. One battery development are illustrated and discussed environmental conditions. The principle of liquid activation was shown to be feasible over the full Its capability of meeting specifications appears temperature range, and the electrical output can simple practical method devised for storage and metadini:robenzene/Ag electrochemical cell and battery sections utilize a Mg/KSCN/NH4SCN-Cliquid NH3 activation. Various stages in the transfer of liquid NH3. (Author)

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 288 097

RADIO CORP OF AMERICA SOMERVILLE N J

ORGANIC DEPOLARIZED PRIMARY BATTERIES

62

LOZIER, G.S.; EISEN, J.B.; 1

## UNCLASSIFIED REPORT

DESCRIPTORS: \*CARBON BLACK, \*CATHODES (ELECTROLYTIC CELL), \*PRIMARY BATTERIES, \*WET CELLS, ACETYLENES (C C), ANODES (ELECTROLYTIC CELL), BENZENES, CARBON COMPOUNDS, ELECTRICAL CONDUCTIVITY, ELECTRODES, ELECTROLYTES, IMPURITIES, MAGNESIUM, NICKEL, NITRO RADICALS, POWER SUPPLIES, RESISTANCE (ELECTRICAL), STORAGE, X RAY (U) 33

DENTIFIERS: NITRO RADICALS, ACETYLENES (C C)

3 was standardized at a compression ratio of 10. The unique performance of Columbian P-1100-CL 20212 in magnesium A-cells is attributed to the rare optimization of these 2 properties. Comparative X-ray diffraction patterns of selected carbon blacks indicate a structural basis for the persistent resiliency of P-1100-CL 20212. Spectrographic evidence of the trace impurities of Al, V. Ni The measurement of electrical conductivity and the volumes of residual voids of 24 carbon blacks and their dry cathode mix blonds with m-dinitrobenzene spectroscopically pure acetylene base Shawinigan in the petroleum base Columbian P-1100 carbon blacks contrasts with the non-resilient Black. (Author)

#### UNCLASSIFIED

ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

HARSHAW CHEMICAL CO CLEVELAND OHIO

HEYERDAHL, NORMAN E.; ? 62 1V 62 395

3

AF33 616 6548 REPT. NO.

62 395 CONTRACT: AF

## UNCLASSIFIED REPORT

DESCRIPTORS: \*PHOTOELECTRIC CELLS (SEMICONDUCTOR),
\*PHOTOTUBES, \*POWER SUPPLIES, \*SOLAR CELLS, \*STORAGE
BATTERIES, CADMIUM COMPOUNDS, CRYSTALS, ELECTRIC
CONNECTORS, EVAPORATION, GROWTH(PHYSIOLOGY), OPTICS,
PROCESSING, SELENIDES, SEMICONDUCTING FILMS,
SEMICONDUCTORS, SINGLE CRYSTALS, SOLID STATE PHYSICS,
SOLVENT ACTION, SPECTROGRAPHIC ANALYSIS, SULFIDES,
TELLURIDES, THIN FILMS (STORAGE DEVICES), VACUUM
APPARATUS, ZINC COMPOUNDS DENTIFIERS: THIN FILMS, THIN FILM ELECTRONICS

33

contact in order to convert a larger fraction of the sun's radiation into electrical power than is possible in a single layer. Five problems are described and the results are tabulated. These problems are: the production of ZnS, ZnSe, PHOTOVOLTAIC LAYERS OF DIFFERENT II-VI semiconductin compounds in intimate electrical INVESTIGATION ON THE FEASIBILITY OF STACKING

ZnTe, dSe, CdS, and CdTe crystals and/or thin films; CdS solar cell mechanism; the preparation of various configurations for study of heterojunctions including ZnS-CdS,

ZnTe-CdS, CdSe-CdS, dTe-CdS, ZnSe-CdSe; and theoretical examinations of the abrupt p-n junction and the effect of surface states upon the electrical properties of semiconducting crystals. (Author)

3

AD- 288 060

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

ELECTRIC STORAGE BATTERY CO MADISON WIS RAY-O-VAC DIV

3 LOW TEMPERATURE BA-2270, J-XLT-I BATTERIES

PAULSON, J. W. ; 62

UNCLASSIFIED REPORT

BATTE:IES), (\*DRY CELLS), (\*POWER SUPPLIÉS), ELECTROLYTES, ITHIUM COMPOUNDS, CHLORIDES, BROMIDES, FAILURE(MECHANICS), CORROSION, ZINC ELECTRODES, BATTERY SEPARATORS, STORAGE, TEMPERATURE, ELECTRIC DISCHARGES, (\*LOW-TEMPERATURE BATTERIES), (\*STORAGE DESCRIPTORS: PRODUCT ION

DENTIFIERS: ZINC ELECTRODES

3 by electrolyte leakage, preferential zinc corrosion, etc., are discussed along with their effect on Twenty-four months delayed testing results are reported for the LiCI:CP-2 low temperature Lelanche system. Discharge tests were run at 700 F, -20 F and -40 degrees F, after 24 months storage at both 70 F and 35 F. Problems caused performance. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMD7

AD- 287 816

GULTON INDUSTRIES INC METUCHEN N J

THE TESTING OF HERMETIC SEALS AND SEPARATORS, POSITIVE PLATE STUDIES, AND INVESTIGATIONS ON THE UNIFORMITY OF SEALED NICKEL-CADMIUM CELLS

SEIGER, H.N.; JUN 62 1V SI REPT. NO. 8 CONTRACT: DA36 039SC85390

UNCLASSIFIED REPORT

\*SCRIPTORS: \*ALKALINE BATTERIES, \*BATTERY SEPARATORS, \*STORAGE BATTERIES, AMIDES, CADMIUM, CERAMIC MATERIALS, DEGRADATION, ELECTRIC POTENTIAL, ELECTRODES, NICKEL, OXYGEN, POLYMERS, PRESSURE, PROCESSING, PROPENES (3 C), WELIABILITY, SEALS (STOPPERS), STORAGE, TESTS DESCRIPTORS:

3 patterns indiated greater crystallinity of electrodes discharged after being stored for 6 months at 50 C than for electrodes stored 2.5 months at 10 C. electrodes was measured for stand periods ranging up capacity dependence upon charge rate was determined after a 24 AH input. Findings were similar to those observed previously for 12 AH input and also for that input required to produce no significant changes in pressure. Charging 6 AH cells at -20 indicated a capacity loss other than that which may F and 100 ma resulted in overchange pressures averaging about 80 PSIG. The dischange capacity at C/2 averaged 2.8 AH to 1.0 volt and 3.4 AH to 0.6 volt. The D evolution from positive without an 8 hour stand period. Capacity was decreased by an average of 9% when the cells were on open circuit for 8 hours after charge. The to 6 months, and the experiment was repeated with stands ranging to 2.5 months. The 2 sets of data were in agreement. Discharge of the electrodes be accounted for by loss of O. X-ray diffaction Cells were charged and then discharged with and (Author)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARL'H CONTROL NO. ZOMO?

AD- 287 518 UNION CARBIDE CONSUMER PRODUCTS CO CLEVELAND OHIO DEPOLARIZERS FOR HIGH ENERGY DENSITY THERMAL BATTERIES. PARTII: DXIDES AND DXYGENATED ANIONS OF THE ELEMENTS OF GROUPS III A TO VI A

SEP 62 1V SENDEROFF, S.;KLOPP, E.M.;KRONENBERG,

CONTRACT: NORD18240

## UNCLASSIFIED REPORT

DESCRIPTORS: "ELECTROLYTIC CELLS, \*POLARIZATION, \*POWER SUPPLIES, \*PRIMARY BATTERIES, ADDITIVES, ALKALI METAL COMPOUNDS, ALKALI METAL COMPOUNDS, CALCIUM, CHÉMICAL REACTIONS, CHORIDES, COPPER COMPOUNDS, DIFFUSION, ELECTRIC DISCHARGES, ELECTRIC POTENTIAL, ELECTRODES, HIGH TEMPERATURE, MAGNESIUM, OXIDES, PHOSPHATES, PHOSPHORUS, REDUCTION, SULFATES, THEORY, THERMAL (U)

Various sulfates, phosphates and other oxygenatedANIONS AND OXIDES OF Groups III A to VI A elements have been shown to be effective depolarizers for thermal batteries at temperatures above 500 C. Polarization curves, chromopotentiometric studies and diffusion measurements used to elidate the mechanism of the electrode reactions indicate that in the case of sulfates, the pyrosulfate ion is the active species at the cathode and that S is a probable endproduct of reduction. In the case of phosphates a complex ixture exists at the cathode which is reduced by one or more steps to P. Large numbers of cell discharge tests were run which confirmed the large energy densty potentially available in cells

3

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MD7

AD- 286 975

EAGLE-PICHER CO JOPLIN MO

RESEARCH INVESTIGATIONS LEADING TO THE DEVELOPMENT AND EVALUATION OF A CADMIUM-SILVER OXIDE BATTERY HAVING A HERMETICALLY SEALED CONSTRUCTION (U)

JUL 62 1V WILSON, J.K.; CONTRACT: DA36 039SC85370

## UNCLASSIFIED REPORT

DESCRIPTORS: \*BATTERY SEPARATORS, \*ELECTROLYTIC CELLS, \*POWER SUPPLIES, \*STORAGE BATTERIES. CADMIUM, CATALYSTS, DESIGN, DIOXIDES, ELECTRIC DISCHARGES, ETHYLENES, HYDROXIDES, IRON COMPOUNDS. MATERIALS, OXIDES, POLYMERS, POTASSIUM COMPOUNDS, RECOMBINATION REACTIONS, SEALS (STOPPERS), SILVER COMPOUNDS, TESTS, WET CELLS (U)

Research was directed toward the attainme of a reliable sealed cadium — silver oxide battery. Among the areas investigated and discussed are improvements in separation, capacity efficiency, overcharge characteristics, and hermetic seals. The overcharge, capacity, self-discharge, charge efficiency, and life characteristics of cells utilizing the positive plate at both its divalent and monovalent capacity levels are discussed. Although the ultimate in performance was not attained, sufficient data were accumulated to allow the construction of sealed cadmium — silver oxide cells with reliable performance characteristics. (Author)

PAGE

#### UNCLASSIFIED

ZOMOZ SEARCH CATROL NO. DOC REPORT BIBLIDGRAPHY

UNITED STATES ELECTRIC MFG CORP NEW ,ORK AD- 286 972

RELIABILITY STUDY HIGH RATE LECLANCHE WAFER

3

CONTRACT: DA36 0395C85266

UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, \*POWER SUPPLIES, MANUFACTURING, RELIABILITY, STORAGE, TEMPERATURE,

3

3 temperatures and times as enumerated below and then tested: 70 F - 3 and 1 yr, 113 F - 3 mo, 6 mo; Each lot of wafer batteries was stored for various 130 F - 3 mo, 160 F - 1 mo. In addition, all lots made with a low temperature electrolyte were tested at 0 and -20 F. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AD- 286 889

LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

NEW CATHODE-ANODE COUPLES USING NONAQUEDUS ELECTROLYTES

3

CHILTON, J.E.; COOK, G. M.; TDR62 837 AF33 616 7957 1V TOR62 837 ASD REPT. NO. CONTRACT: SEP MONITOR:

## UNCLASSIFIED REPORT

CONDUCTIVITY, ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, ELECTROLYTE CELLS, LITHIUM, MATERIALS, METALS, NICKEL COMPOUNDS, POLARIZATION, PROPENES (3 C), SILVER COMPOUNDS, SOLUTIONS(MIXTURES), TESTS ESCRIPTORS: \*ANODES (ELECTROLYTIC CELL), \*CATHODES (ELECTROLYTIC CELL), \*POWER SUPPLIES, \*STORAGE BATTERIES, ALUMINUM COMPOUNDS, CARBONATES, CHLORIDES, ELECTRIC CURRENTS, ELECTRIC POTENTIAL, ELECTRICAL DESCRIPTORS:

3 New cathode-anode couples using nonaqueous electrolyt s were investigated as secondary batteries for use in orbiting satellites. A Li anode is used with either a AgCI or NiCl2 cathode in electrolyte was found to be stable. Many metals were anodically oxidized in this electrolyte and found to be somewhat soluble and therefore unsuitable for use. Li metal was electrodeposited at 100% efficiency at current densities up to at least 80 ma/ sq cm. NiC12 as produced at 100% efficiency experiments indicated that mass transport may be the discharge. Electrode spacing experiments indicated that cells are limited primarily by resistance. A densities up to at least 72 ma/sq cm. Polarization conduction. Migration experiments agreed with he only at very low current densities, whereas AgCl cell was successfully cycled at -23 C. (Author) chloride was found to increase with increasing AlCl3 concentration. Electrical conductivity predicted mechanism. Electrode reactions were studied in detail. The C3H6C03-A1C13 measurements showe low activation energy for limiting factor for the AgCI cathode during was produced at 100% efficiency at current Alc13, and LiC1. The solubility of lithium an electrolyte consisting of C3H6C03,

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 286 520 EAGLE-PICHER CO JOPLIN MO RESEARCH ON AMMONIA BATTERY SYSTEM

3

JUL 62 1V DOAN, D.J.: WOOD, L.R.; CONTRACT: DA36 0395C85396

## UNCLASSIFIED REPORT

DESCRIPTORS: \*ELECTROLYTES, \*ELECTROLYTIC CELLS, \*POWER SUPPLIES, \*PRIMARY BATTERIES, \*WET CELLS, AMMONIA, ANDDES (ELECTROLYTIC CELL), BATTERY SEPARATORS. BINDERS, CATHODES (ELECTROLYTIC CELL), CHLORIDES, ELECTRIC DISCHARGES, ELECTRIC COMPOUNDS, POLYMERS, SILVER COMPOUNDS, SULFATES, VINYL PLASTICS

AMMONIA BATTERY SYSTEM. MINUS 54 C ACTIVATION OF MULTICELL UNITS WAS IMPROVED BY REDUCTION OF CURRENT LEAKAGE. INCREASED ENERSY PER UNIT WIT WAS ACCOMPLISHED THROUGH IMPROVED HARDWARE DESIGN AND CONCENTRATED CELL STRUCTURE. HGSO4 AND AGC1 CATHODES WERE USED. INITIAL SINGLE CELL, LOW-RATE, LONG-DURATION DISCHARGES OVER ABOUT 24 HOURS WERE MADE BUT PRODUCED EXCESSIVE GASSING.

#### UNCLASSIFIED

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

GENERAL MOTORS CORP KOKOMO IND DELCO RADIO DIV SILVER ZINC SECONDARY BATTERY INVESTIGATION

3

OCT 62 1V LANDER, J.J.; KERALLA, J.A.; CONTRACT: AF33 657 8943

## UNCLASSIFIED REPORT

DESCRIPTORS: \*ALKALINE BATTERIES, \*ELECTROLYTIC CELLS,
\*SILVER COMPOUNDS. \*STORAGE BATTERIES, \*ZINC COMPOUNDS,
ADDITIVES, BATTERY COMPARTMENTS, ELECTROLYTES,
ETHYLENES, HYDROGEN, HYDROXIDES, OXIDES, PALLADIUM,
POLYMERS, POTASSIUM COMPOUNDS, POWDER METALS, VINYL
ALCOHOL

Pd additions to the Ag positive plates of 0.2, 0.5, and 1% were tested in 25 amp/hr cells on the 2-hr cycle period. It was found that 1% Pd addition produces the maximum monovalent charge capacity of 50% and retains this level for approximately 200 cycles. Ag powders of different particle size were incorporated into 2 amp/hr cells an preliminary cycle data was obtained. Negative plates containing polyethylene oxide and polyvinly alcohol are on the 2-hr cycle program. Five hundred cycles at 25% depth of discharge have been reached to date. Hydrogen evolufion data was obtained from zinc negative plates containing 1, 2, and 4% HgO in various concentrations of KOH for a 2-wk period. (Author)

3

PAGE

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO RADIO (SELECTED ARTICLES). AD- 286 135

JUN 62 1V REPT. NO. TT 62 357

## UNCLASSIFIED REPORT

DESCRIPTORS: \*POWER SUPPLIES, \*STORAGE BATTERIES, CADMIUM, CYLINDRICAL BODIES, DISKS, MAINTENANCE, MANGANESE, MERCURY, NICKEL, OPERATION, SEALS (STOPPERS), TRANSISTORS, ZINC (U)

Contents: Restoration of storage batteries Small size hermetically sealed batteries

3

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

MALLORY (P R) AND CO INC INDIANAPOLIS IND

MERCURY CELL BATTERY INVESTIGATION

3

3

BODE, J.M.; RALSTON, R. E.; SEP 62 1V CONTRACT: AF33 657 7706

## UNCLASSIFIED REPORT

3 DESCRIPTORS: \*ALKALINE BATTERIES, \*ELECTROLYTIC CELLS,
\*MERCURY, \*POWER SUPPLIES, \*STORAGE BATTERIES, ANODES
(ELECTROLYTIC CELL), BATTERY SEPARATORS, CARBON,
CATHODES (ELECTROLYTIC CELL), CHEMICAL REACTIONS, DUCTED
ROCKETS, DUMMY LOADS(ELECTRICITY), HYDROXIDES,
MATERIALS, PALLADIUM, PORQUS MATERIALS, POTASSIUM
COMPOUNDS, RESISTANCE (ELECTRICAL), SATELLITES (ARTIFICIAL) DESCRIPTORS:

to study electrode spacings. An alternating current method of separator resistance measurement was evaluated. The characteristics of several membrane type separators after exposure to degrading environments are presented. The use of palladium in discharge experiments with the negative electrode Chemical reactivity rate determination was directed version of the exploratory research cell which will accommodate the compartmented liquid anode retainer experimental cells passed 1000 cycles. Preliminary specimens of the liquid anode retaining member for was fabricated. This design was successfully used toward improving precision and reliability. Data densification. Automatic cycle test life of some in the positive electrode continued to show high Porous forms of carbon were studied as possible are presented showing the effects of several variables studied during this period. A plastic efficiency with respect to charge acceptance. this larger test cell were produced. (Author) expanders to control positive electrode

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PAGE

ZOMOZ SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

AD- 284 891

WESTINGHOUSE ELECTRIC CORP LIMA OHIO

THERMALLY ACTIVATED CERAMIC-METAL CELLS

 $\Xi$ 

TDR62 397

AF33 616 8231 CONTRACT: REPT. NO.

TDR62 397

## UNCLASSIFIED REPORT

3 SUPPLIES, \*STORAGE BATTERIES, BORON COMPOUNDS, CERAMIC COATINGS, CERAMIC MATERIALS, ELECTRIC DISCHARGES, ELECTRICAL CONDUCTIVITY, ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, ELECTROLYTIC CELLS, IONS, IRON, LITHIUM COMPOUNDS, SILICATES, SILVER, SOLIDS DESCRIPTORS: \*ELECTRIC POWER PRODUCTION, \*POWER

INVESTIGATIONS WERE MADE OF THE ENERGY CONVERSION MECHANISM IN THERMALLY ACTIVATED CERAMIC-METAL CELLS. borosilicate enamel-electrolyte and Ag cathode cell free energy of anode oxidation reaction. Chemical analyses of discharged cells indicated Li migrated anode. Electric power generation resulted from the in the electrolyte to the cell cathode. Recharging of cells was not successful due to the iron oxide stability; however, anomalous charge storage was noted at 450 C. Cells made of more reactive anode range was 450 to 700 C with 600 C being the most satisfactory. The Ag cathode functioned as a gas electrode which absorbed 0. The enamel's ionic conductivity increased with temperature and transferred 0(--) from the cathode to the configuration. The cell operation temperature Research was focused upon the Fe anode, Li materials were studied.

3

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ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

AD- 284 473

RADIO CORP OF AMERICA SOMERVILLE N J

HIGH-CAPACITY MAGNESIUM BATTERIES

3

LOZIER, G.S.; RYAN, R.J.;

DESCRIPTORS: \*DRY BATTERIES, \*ELECTROLYTIC CELLS, \*POWER SUPPLIES, \*PRIMARY BATTERIES, ANDDES (ELECTROLYTIC CELL), COPPER COMPOUNDS, CORROSION, LOW TEMPERATURE BATTERIES, MAGNESIUM COMPOUNDS, MERCURY COMPOUNDS, OXIDES, PERCHLORATES UNCLASSIFIED REPORT > DESCRIPTORS: 62 MAY

low- emperature characteristics of magnesiummagnesium efficiency data with magn sium corrosion film studies are present d. Results from magnesium ano e efficiency studies are summarized for pure magnesium and AZ-21X1 alloy over a current density range of for magnesiummagnes um perchlorate-mangan se dioxide A-cells nd -c 11 batteries discharged at -20 F perchlorate-mercuric oxide a d cupric oxi e reserve conducted to evaluate the use of a titanium cathode grid are summarized. Low-tempera une capacity da a Work continued on the high-capacity magnesium battery program. Data are presente which show the Capacity da a for three c 11 batteries are al o nocluded. Data from mercuric oxide cell studies cells at ambient temperatures down to -58 F. 0.09 to 10.9 ma/sq. cm. A correlation of the is also presente . (Author)

UNCLASSIFIED

PAGE

FEASIBILITY STUDY ON HIGH PERFORMANCE, SHORT DURATION UNION CARBIDE CONSUMER PRODUCTS CO CLEVELAND OHIO

POWER BATTERIES

CONTRACT: NORD182.3

UNCLASSIFIED REPORT

3 DESCRIPTORS: \*POWER SUPPLIES, \*PRIMARY BATTERIES, CATHODES (ELECTROLYTIC CELL), COPPER COMPOUNDS, DIFFUSION, ELECTROCHEMISTRY, ELECTROLYTES, EUTECTICS, IONS, LITHIUM COMPOUNDS, MATERIALS, PHOSPHATES, POLARIZATION, POTASSIUM COMPOUNDS, SALTS, SULFATES, THERMOCHEMISTRY

 $\widehat{\Xi}$ the phosphate ion failed, the metaphosphate ion is converted to the much less soluble orthocompound by traces of moisture. The diffusion coefficient as well as the activation energy for the diffusion process were determined for the sulfate ion. D at 500 C was found to be 1.95 x 10 to the -5th power sq cm/sec; activation energy was 5765 cal. Cell tests improved power outputs from both Li2SO4-K2SO4 and CuPO3-LiPO3 combinations when they were used as depolarizers. (Author) Attempts to determine the diffusion coefficient of

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND

3 EVALUATION TESTS OF SIX AIRCRAFT BATTERIES, LEAD ACID, TYPE MS 25211 (AER), REPRESENTING LOT NO. 1 OF CONTRACT N383-751044, MANUFACTURED BY GOULD NATIONAL BATTERIES, INC

AUG 62 1V REPT. NO. QE C 62 452

UNCLASSIFIED REPORT

DESCRIPTORS: \*AIRCRAFT, \*STORAGE BATTERIES, \*TESTS, ELECTRIC CURRENTS, ELECTRIC POTENTIAL, ELECTROLYTES, LEAD(METAL), SEALING COMPOUNDS, SULFURIC ACID, VIBRATION, WET CELLS

 $\Xi$ 

Evaluation tests were conducted on five batteries. Battery, type MS 25211 (AER) is a 12cell, 24-volt, lead acid aircraft storage battery having a rated capacity of 20-ampere-hours at the two hour rate. Four batteries failed to meet the minimum requirements of 100 percent of the rated two hour capacity at the 100 percent of the rated two hour capacity at the 100 th cycle. Three batteries failed on the 61st cycle and one battery on the 63rd cycle. Battery C-1-7E, subjected to the environmental tests, failed before completion of two hours of the required nine hours of vibration. The open circuit voltage dropped from 25.4 to 16.0 volts. The load voltage dropped from 23.4 to 6.0 volts. (Author)

ZOMO2 DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO.

AD- 283 434

WESTINGHOUSE ELECTRIC CORP PITTSBURGH PA

3 AN INVESTIGATION OF SOLID ELECTROLYTE FUEL CELLS

ARCHER, D. H.; CARLSON, W. G.; CONTRACT: AF33 657 8251

## UNCLASSIFIED REPORT

SECRIPTORS: \*DRY BATTERIES, \*FUEL CELLS, \*POWER SUPPLIES, CALCIUM COMPOUNDS, CERAMIC MATERIALS, ELECTRICAL CONDUCTIVITY, ELECTRODES, ELECTROLYTES, ELECTROLYTIC CELLS, GLASS SEALS, METAL SEALS, OXIDES, PLATINUM, SEALS (STOPPERS), SOLIDS, SPACECRAFT, YTTRIUM COMPOUNDS, ZIRCONIUM COMPOUNDS DESCRIPTORS:

sealing cells were investigated so that large systems be solved in order to produce a practical power syste reasonable to predict that solid el ctrolyte fuel cell systems can be built which will produce 125 watt/lb sub m and 400 watt/cu ft and will last over can be fabricated. More work remains to be done in procedures were worked out for evaluating these this area. A number of cell tests were carried out to determine the performance of electrolytes, electrodes and seals. The experimental cells and cell systems revealed much concerning the basic cells. They have demonstrated problems which must optimum electrode was prepared. Three methods of phenomena associated with solid electrolyte fuel . The experience with these cells makes it seem An electrolyte material with a resistivity less than one-fifth th t of (ZrO2)0.85(CaO)0.15 electrodes. A systematic program for finding an was discovered. Various methods for applying 600 hours. (Author)

#### UNC!ASSIFIED

SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

AD- 282 723

MELPAR INC FALLS CHURCH VA

A THIN-PLATE BATTERY

3

CONTRACT: NOW-60-0362 62

AMBROSE, J. F.; SMIT, J.;

UNCLASSIFIED REPORT

3 AMMONIA, ANDDES (ELECTROLYTIC CELL), BINDERS, CATHODES (ELECTROLYTIC CELL), BINDERS, CATHODES (ELECTROLYTIC CELL), DESIGN, ELECTROLYTES, ENCAPSULATION, EPOXY RESINS, FILAMENT WOUND CONSTRUCTION, GLASS TEXTILES, LITHIUM, MAGNESIUM, MANUFACTURING, NITROBENZENES, PRESSURE, TESTS DESCRIPTORS:

3 metal anode, such as Mg or Li. The electrolytic solution for this system contains liquid ammonia as the solvent. The energy content of this system is adequate; the anodic materials are light in requirements of a high-energy-density battery delimit packaging, and encompass both the energyweight weight and high in potential; and the lowtemperature regulation within the military range of operating temperature. The cell is composed of an organic cathode metadinitrobenzene) and a light, active, fabrication of an encapsulated battery unit was density and the energy-volume density of power sources. The specifications demand high drain range of the liquid solvent extends beyond the Feasibility studies on miniaturizing the NOLC liquid activated ammonia cell continued. The rates for 6 to 10 min. through 10% voltage military operating range. The design and completed. (Author)

UNCLASSIFIED

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AD- 282 723

363

AD- 282 390

ZOM02 SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

DOW METAL PRODUCTS CO MIDLAND MICH

INVESTIGATION OF THE MAGNESIUM ANODE

3

MAR 62 1V ROBINSON, J.L.; CONTRACT: DA36 0395C88912

UNCLASSIFIED REPORT

DESCRIPTORS: \*ANODES (ELECTROLYTIC CELL), \*DRY
BATTERIES, \*MAGNESIUM ALLOYS, \*PRIMARY BATTERIES,
ACETAES, CALCUM COMPOUNDS, CHLORIDES, CORROSION,
EFFECTIVENESS, ELECTROLYTES, INTERCOMMUNICATION SYSTEMS,
MAGNESIUM COMPOUNDS, PERCHLORATES, POLARIZATION, WET
CELLS

MAXIMUM EFFICIENCY OF A MG ALLOY ANDDE DEPENDENCY ON RELATIVE ACIDITY OF ELECTROLYTE.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

GULTON INDUSTRIES INC METUCHEN N AD- 282 390

STATE OF CHARGE INDICATORS FOR ALKALINE

BATTERIES

3

LURIE, M.; SEIGER, H.N.; AUG 62 1V CONTRACT: AF33 657 8130

UNCLASSIFIED REPORT

3 DESCRIPTORS: \*ALKALINE BATTERIES, \*CAPACITANCE, \*PULSE ANALYZERS, ELECTRIC CURRENTS, ELECTRIC POTENTIAL, ELECTRIC DOUBLE LAYER, ELECTRONIC SWITCHES, IONIC CURRENT, OSCILLATORS, OSCILLOSCOPES, RESISTANCE (ELECTRICAL), TESTS DESCRIPTORS:

3 Results of the transient peak height measurements have been inconsistent. The height shows a somewhat random variation although there is a general state of charge that were too large to be acceptable. Iwo successive refinements in the apparatus failed to reduce this error appreciably. The phase techniques rely on the measurement of the shift in phase between the cell voltage and current. It appears that with the phase method a battery would have to be tested cell by cell. With the resistance method an entire battery could be checked with one measurement by bringing all cell terminals with state of charge but the lack of re-roducibility of the measurements caused errors in predicting the The work described has been divided into two major categories: Pulse Techniques and Phase Techniques. For the pulse techniques, a load was connected to a test cell through an appropriate switch so that the current was suddenly increased decrease in transient peak height with decreasing The parameters being studied were displayed on AN capacity. The ohmic resistance shows a capacity to a common multi-pin connector on the battery. dependence. The double layer capacitance varied from zero to the required value. These values changed from C/2 to 100C on 4 Amp-Hr cells. OSCILLOSCOPE AND A PHOTOGRAPHIC RECORD MADE. (Author)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 282 174
UNION CARBIDE CONSUMER PRODUCTS CO CLEVELAND OHIO

LOW TEMPERATURE BA-2270/U BATTERIES. (U)

DESCRIPTIVE NOTE: Final rept., 1 Nov 56-31 May 62, MAY 62 54P Soltis, D. G.; Zeitz, E.

CONTRACT: DA-039-SC-73092

## UNCLASSIFIED REPORT

DESCRIPTORS: (\*DRY CELLS), (\*BIAS BATTERIES), (\*LOW TEMPERATURE BATTERIES), (\*ELECTROLYTIC CELLS), (\*CATHODES(ELECTROLYTIC CELL), ARCTIC REGIONS, TEMPERATURE, STORAGE BATTERIES, DESIG, CONSTRUCTION (U)

The BA-2270/U battery in the Cathodic Envelope construction gives an actual initial low temperature service level equivalent to 4 times that obtained under other contracts using conventional constructions. Increased electrode area and more intimate contact between materials of construction over the entire operating temperature range have been the prime factors giving this higher service level. High electrolyte solution volumes, higher concentrations of active ore and positive sealing of cells have also contributed to the service advantage. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 281 842

HARRY DIAMOND LABS WASHINGTON D C

VACUUM DEPOSITED INDIUM FILMS, PROPERTIES AND USE AS FUSIBLE ELEMENTS FOR THERMAL BATTERIES, (U)

JUL 62 42P Bullis , L. H. ; Boesman, W.

REPT. NO. TR-1047 PROJ: 96391

## UNCLASSIFIED REPORT

DESCRIPTORS: \*INDIUM, \*METAL FILMS, \*POWER SUPPLIES, \*PRIMARY BATTERIES, \*THIN FILM STORAGE DEVICES, MELTING, MICA, ELECTRICAL RESISTANCE, STORAGE, TEST METHODS, THERMAL BATTERIES, VAPOR PLATING (M) IDENTIFIERS: METALLIC SMOKE DEPOSITS, THIN FILMS (M)

Need for a means of determining whether a thermal battery had been accidentally activated prior to its installation in a piece of equipment led to an investigation of thin metal films that melt at temperatures between 100 and 200 C, and have high resistances after and low resistances before melting. Indium films in thicknesses ranging from 200 to 5300 angstroms were vacuum-deposited onto mica substrates. Prior to melting at 155 C, these films were continuous and exhibited low resistance (less than 1 ohm). On melting, the films agglomerated into discrete particles, because indium will not were obtained. Thus, satisfactory elements were obtained on mica. (Author) (U)

UNCLASSIFIED

PAGE

AD- 281 842

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

DEPOLARIZERS FOR HIGH ENERGY DENSITY THERMAL BATTERIES. PART I: COPPER OXIDE AND ANTIMONY OXIDE (U) UNION CARBIDE CONSUMER PRODUCTS CO CLEVELAND OHIO

JUN 62

SENDEROFF, S.; KLOPP, E.M.; KRONENBERG, 1

CONTRACT: NORD18240

## UNCLASSIFIED REPORT

SUPPLIES, \*PRIMARY BATTERIES, ADDITIVES, ANTIMONY COMPOUNDS, CHLORIDES, COPPER COMPOUNDS, ELECTRIC DISCHARGES, ELECTROCHEMISTRY, ELECTROLYSIS, ELECTROLYTES, EUTECTICS, HIGH TEMPERATURE, LITHIUM COMPOUNDS, MIXTURES, OXIDES, POTASSIUM COMPOUNDS, SALTS, THERMAL BATTERIES, THERMOCHEMISTRY DESCRIPTORS:

3 In a theoretical and xlanimental screening of large numbers of compoun s for use as depolarizers in igh energy density thermal cells, CuO and basis of their thermodynamic properties, thermal sability, and solubility and compatibility with molten were determined by study of polarization curves and operating for five minutes at a power of 10 KW with an energy density of 100 watt-hrs/1b. (Author) indicate that properly designed thermal cells wit these depolarizers may be suitable for a battery chloride electrolytes. Electrochemical properties experimental cell disch rge characteristics and Sb203 emerged as two promising materials on t e

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD-

AEROJET-GENERAL CORP AZUSA CALIF

INVESTIGATION OF AN ENERGY CONVERSION DEVICE

FOGLE, R. F.; LAWSON, H. E.; RAROGIEWICZ 2 OCT 61

CONTRACT: DA36 0395C87229

## UNCLASSIFIED REPORT

\*STORAGE BATTERIES, AIR, ARGON, BISMUTH COMPOUNDS, CATALYSTS, CONTROLLED ATMOSPHERES, DECOMPOSITION, ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, ENERGY CONVERSION, GRAPHITE, HIGH TEMPERATURE, IODIDES, DESCRIPTORS: \*ELECTROLYTIC CELLS, \*POWER SUPPLIES, MATERIALS

3

whereas similar cells operated in air deteriorated in The purpose of this investigation is to develop a practical cell in which a metal halide is decomposed by heat to liberate its elements, which are then recombined to form the original metal halide and Produce an electric current. Open cells tested in an Ar atmosphere operated for more than 60 hour , necessary for operation of the cell under the conditions of this test. The presence of electrolyte, C, and Bi metal were all found to affect the over-all decomposition of Bil3 by approximately 4 hours. I an Bil3 were lost from the cells during operation. It was demonstrated that the presence of Bil3 is

ZOMOZ SEARCH CONTROL NO. DOC MEPORT BIBLIOGRAPHY

MADIO COMP OF AMERICA SOMERVILLE N J

EVALUATION OF NEW CATHODE-ANODE COUPLES FOR SECONDARY BATTERIES

UHLER, E. F. ; LOZIER, G. S. ; AF33 616 7505 TDR62 TOR62 4 REPT. NO. CONTRACT: MONITOR:

## UNCLASSIFIED REPORT

3 ESCRIPTORS: \*ANGDES (ELECTROLYTIC CELL), \*CATHODES (ELECTROLYTIC CELL), \*STORAGE BATTERIES, \*WET CELLS, ALKALI METALS, ALUMINUM, BATTERY COMPARTMENTS, BATTERY SEPARATORS, CERAMIC MATERIALS, CHLORIDES, DESIGN, ELECTROLYTES, MATERIALS, MELTING, DESCRIPTORS:

DESIGN CRITERIA FOR LONG-'IFE, LIGHT-WEIGHT, SECONDARY BATTERIES WITH MOLTEN SALT ELECTROLYTES AND CERAMIC SEPARATORS.

#### UNCLASSIFIED

SEARCH CONTROL NO. DOC REPORT BIBLIDGRAPHY

LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

NEW CATHODE-ANDDE COUPLES USING NONAQUEDUS ELECTROLYTES

3

CHILTON, J.E. JR.; AF33 616 7957 TOR62 REPT. NO.

UNCLASSIFIED REPORT

TDR62 1

MONITOR:

33 DESCRIPTORS: \*POWER SUPPLIES, \*SOLAR CELLS, \*STORAGE BATTERIES, ALKALINE EARTH METALS, ALUMINUM, ANDDES (ELECTROLYTIC CELL), CATHODES (ELECTROLYTIC CELL), CATHODES (ELECTROLYTIC CELL), COPPER COMPOUNDS, ELECTRICAL CONDUCTIVITY, ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, ELECTROLYTIC CELLS, LITHIUM, MATERIALS, METALLIC COMPOUNDS, ORGANIC SOLVENTS, SATELLITES (ARTIFICIAL), SOLUTIONS(MIXTURES)

3 nonaqueous media was studied by measuring the current efficiency for metal deposition or dissolution as a New anode-cathode couples using nonaqueous solvents were investigated for use as secondary batteries for power sources in orbiting satellites.

Reversibility of anode and cathode reactions in function of current density. At densities of 20 ma/sq cm, Mg from a Mg ethyl bromide-ethyl ether solution, K from a POC13-KI system, Al from an AIC12-n hexylamine-ethyl ether system showed low reversibility. High current efficiences were found for Li electrodeposition from a at propylene carbonate Li salt system and for an AlCl3-ethyl pyridinium bromide-toluene system 20 ma/sq cm current density. After anodic oxidation of many metals, NiCl2 and AgCl were insoluble in the propylene carbonate system; pyridinium bromide-toluene solution. (Author) Nic12 was insoluble in the AIC13-ethyl

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AD- 277 197

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AD- 277 108

SPRAGUE ELECTRIC CO NORTH ADAMS MASS

INDUSTRIAL PREPAREDNESS MEASURES ON SOLID ELECTROLYTE BATTERY BA-388( )/U

BELL, W. F.; CEELY, A.G.; 1 9 DEC

UNCLASSIFIED REPORT

AUTOMATION, CATHODES (ELECTACLYTIC CELL), CONTAINERS, DESIGN, ELECTROLYTES, EXTRUSION, INDUSTRIAL PRODUCTION, MANUFACTURING, MATERIALS, PRODUCTION, QUALITY CONTROL, SEALS (STOPPERS), SOLIDS (U) \*DRY BATTERIES, \*PRIMARY BATTERIES, DESCRIPTORS:

SOLID ELECTROLYTE BATTERIES. PROJUCTION PROBLEMS: BATTERY ASSEMBLY USING AN EPOXY RESIN AS THE OUTER CASE; DESIGN OF AG SHELLS FOR INDIVIDUAL CELL CONTAINERS, SEALS AND LEAD ASSEMBLIES; CATHODE EXTRUSION.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AD- 276 649

GENERAL MOTORS CORP ANDERSON IND DELCO-REMY DIV

TEST REPORT ON SEALED SILVER OXIDE-ZING SECONDARY

3

KERALLA, J.A.: 62 1V KEF TR61 636 FAF33 600 41600 ASD TR61 636 REPT. NO.

CONTRACT: MONITOR: UNCLASSIFIED REPORT

ACCELERATION, BATTERY COMPARTMENTS, BATTERY SEPARATORS,
DATA, ELECTRIC CURRENTS, ELECTRIC POTENTIAL, ELECTRODES,
ELECTROLYTES, HYDROXIDES, NYLON, OXIDES, PLASTIC SEALS,
POTASSIUM COMPOUNDS, PRESSURE, SHOCK RESISTANCE, SILVER
COMPOUNDS, TESTS, VIBRATION, ZINC DESCRIPTORS:

3

jars and placed on cycle life test. A projected battery energy-to-weight ratio utilizing these eight Sixty-five cells, constructed with hand-fabricated lucite containers and equipped with pressure gauges, were employed to determine cycle life using various previous eighty-one cells, were activated in lucite combination was also determined at three different depths of discharge in three different temperature ranges. The maximum cycle life obtained from the above group was 1760 cycles at 21% depth of discharge at room temperature. Three cells with molded nylon containers and covers, with a metal terminal-to-plastic seal successfully passed the required environmental tests. This and five cells construction except for a negative plate variation have completed over 400 cycles. Eight ceils, with the same construction have completed over 600 combinations of separators and negative plate employing the best design parameters from the cycles. Eight additional cells with the same cells is about 8 whr/lb for the 2-hr cycle. additives. Cycle life with one separator (Author)

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UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

RADIO CORP OF AMERICA SOMERVILLE N J

ORGANIC DEPOLARIZED PRIMARY BATTERIES

3

61 1V LOZIER, G.S.; EISEN, J.B.; RYAN, R.J.; F. DA 36-039-sc-87243 CONTRACT: DA 36-039 PROJ: 3A 99-09-002 DEC 61

## UNCLASSIFIED REPORT

DESCRIPTORS: \*CARBON BLACK, \*CATHODES (ELECTROLYTIC CELL), \*ELECTROLYTIC CELLS, \*PRIMARY BATTERIES, \*WET CELLS, ADSORPTION, ANODES (ELECTROLYTIC CELL), BENZENES, CARBON, ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, MAGNESIUM, NITRO RADICALS, STORAGE, TESTS (U) IDENTIFIERS: NITRO RADICALS (M)

3 summarized for two carbon blacks selected as superior from adsorption tests and capacity tests for absorbed given. Eighteenmonth storage-test results are given A method is presented for testing various carbon blacks used with organic nitro-cathode materials based on the ability of the carbon black to adsorb saturated with m-dinitrobenzene. The data obtained for AZ-10 magnesium A-cells; 3-month storage-test data are presented for AZ-21 magnesium A-cells to others tested. A-cell-capacity test data are m-dinitrobenzene from 2N magnesium perchlorate m-dinitrobenezene on various carbon blacks are summarized. Effects of reaction products are discussed, and adsorptioncapacity tests are made with various carbon blacks. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

GENERAL ELECTRIC CO PHILADELPHIA PA MISSILE AND SPACE

INVESTIGATION AND FLIGHT TEST OF ION EXCHANGE MEMBRANE FUEL CELLS

3

READ, M.D. ; KLAWANS, B.;

AF33 616 7579 62 1V TDR62 19 REPT. NO. MONITOR:

## UNCLASSIFIED REPORT

TDR62 19

ASD

DESCRIPTORS: \*FUEL CELLS, \*STORAGE BATTERIES, CONTAINERS, DESIGN, ELECTRODES, ELECTROLYTIC CELLS, FLIGHT TESTING, GRAVITY, ION EXCHANGE, MEMBRANES, PLATINUM, POTASSIUM COMPOUNDS, TESTS, WEIGHTLESSNESS

3

of life cycle tests was carried out in the laboratory with both single cells and multicell units. The results of single cell tests are quite satisfactory; however, multicell units as presently designed do not aircraft was initiated to determine the effect of a limited time zero gravity environment on fuel cell these flights did not have an appreciable effect on fuel cell operation as determined by oscillograph recordings and photographs taken of the unit during operation. The environmental conditions imposed by membrane as a matrix to immobilize the potassium hydroxide electrolyte were investigated. A series The operating capabilities of a hydrogen-oxygen regenerative fuel cell which employs an anion show comparable life. A flight test on an

3

PAGE

AD- 276 272

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 275 983

GULTON INDUSTRIES INC METUCHEN N J

NICKEL-CADMIUM BATTERIES

KANTNER, E.; LYALL, A.E.; SHAIR, R.C.; TDR62 67 REPT. NO.

TDR62 67 AF33 600 41670 MONITOR:

## UNCLASSIFIED REPORT

\*\*SCRIPTORS: \*ALKALINE SATTERIES, \*ELECTROLYTIC CELLS, \*STORAGE BATTERIES, ANODES (ELECTROLYTIC CELL), BATTERY SEPARATORS, CANTAINERS, DESIGN, ELECTROCHEMISTRY, ELECTRODES, MATERIALS, NICKEL, NICKEL COMPOUNDS, POWER SUPPLIES, REACTION KINETICS, SATELLITES (ARTIFICIAL), SEALS (STOPPERS), TESTS (U) DESCRIPTORS:

3 optimum quantity of electrolyte to improve overcharge fabricated, assembled, and tested. Heat from welding the cover to the can frequently damaged the seal. This w s overco e by pplying heat sinking to conduct the heat away from the seal. In e cover was rede igned to eliminate shadowing, which prevented proper seal formation. Results indicated that the polypropylene appear d to be the most desirable from the standpoint of over-all performance. E FFORTS TO IMPROVE THE WATT-HOUR EFFICIENCY OF SEALED NICKELof reactions at the negative electrode was demonstrated. Laboratory type ealed cells were assembled so hat in case of failure they could be disassembled without damaging any of the components. (Author) was that which completely filled the pores of the separator and plates. Of the various sep rator IMPROVED OVERCHARGE CAPABILITIES. The complexity CADMIUM CELLS RESULTED IN NEGATIVE PLATES WITH materi Is ested no woven nylon and nonwoven Sealed cells of different designs were

#### UNCLASSIFIED

DOC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

UNION CARBIDE CONSUMER PRODUCTS CO CLEVELAND OHIO

HIGH VOLTAGE, GAS ACTIVATED BATTERIES

3

DEIERHOI, WILLIAM H. JR.;

3

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REPT. NO. RR-179 CONTRACT: DA36 039SC74856

PROJ: AF-3952

## UNCLASSIFIED REPORT

3 \*ELECTRIC POWER PRODUCTION, \*GUIDED MISSILE BATTERIES, \*MANUFACTURING, \*PRIMARY BATTERIES, \*WET CELLS, DESIGN, ELECTRIC POTENTIAL, ELECTRODES, ELECTROLYTES, GAS GENERATING SYSTEMS, HEATERS, HYDROXIDES, OXIDES, POTASSIUM COMPOUNDS, RELEASE MECHANISMS, SILVER, SILVER COMPOUNDS, TESTS, THERMOSTATS, ZINC

activated reserve Ag20/Zn battery to operate between 24.5 and 27 v. on a one ohm load for 80 sec. with a voltage regulation of not more than one volt. Electric heater mechanism to operate from -40 C. Design and fabrication was undertaken of a gas

generator initiated by electric pulse to provide full battery output power in 1/2 sec. Data shows that dendritic zinc duplex electrode system as built into the end item. The major problem encountered was in indicate that it is possible to meet the technical provided by an easily manufacturable 19-cell Ag20 achieving a uniform fill of KOH electrolyte into the 0.049 in. thick cells of the active battery stack. Funds expired before a reliable fill was provided. The activating mechanism was a gas improvements to the fill mechanism were made to the electrical output requirements are readily mechanism was proven. Sufficient additional

requirements. (Author)

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

AD- 275 749

EAGLE-PICHER CO JOPLIN MO

3 RESEARCH INVESTIGATIONS LEADING TO THE DEVELOPMENT AND EVALUATION OF A CADMIUM - SILVER OXIDE BATTERY HAVING A HERMETICALLY SEALED CONSTRUCTION

CONTRACT: DA36 0395C85370

## UNCLASSIFIED REPORT

3 ESCRIPTORS: \*BATTERY SEPARATORS, \*ELECTROLYTIC CELLS, \*STORAGE BATTERIES, \*WET CELLS, CADMIUM COMPOUNDS, DESIGN, MATERIALS, OXIDES, SEALS (STOPPERS), SILVER COMPOUNDS, TEMPERATURE, TESTS

3 type separation sufficiently resist oxidation by, and retard migration of, the Ag ion. Capacity on amasurements of positive and 5370, Proj. 3A99-09-002) Unclassified report DESCRIPTORS:
\*Electrolytic cells, \*Wet cells, \*Storage batteries, Cadmium compounds, Silver compounds, Analyses of cycle life test data on fully assembled Charge efficiency data disclose that maximum capacity is obtained by subjecting either plate to active materials were continued. The measurements 30% overcharge, regardless of the temperature at which the plates are charged. It was shown that amount of electrolyte contained by a cadmium silver oxide cell has considerable influence on capacity efficiency and rate of recombination. Apparent positive and negative plate density Materials, Design, Tests, Temperature.Analyses of cycle life test dative cover the temperature range of -60 to +120 F. Oxides, \*Battery separators, Seals,

studies are discussed. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

AD- 275

AMERICA SOMERVILLE N J RADIO CORP OF

3 EVALUATION OF NEW CATHODE-ANDDE COUPLES FOR SECONDARY BATTERIES

UHLER, E. F.; FIELDS, D. ; LOZIER, G.S.; ? APR 62

UNCLASSIFIED REPORT

33 DESCRIPTORS: \*ANODES (ELECTROLYTIC CELL), \*CATHODES (ELECTROLYTIC CELL), \*STORAGE BATTERIES, ALKALI METALS, ALKALINE EARTH METALS, ALUMINUM, BATTERY COMPARTMENTS, BATTERY SEPARATORS, CERAMIC MATERIALS, C''LORIDES, DESIGN, ELECTROLYTES, FLUORIDES, GLASS SEALS, LITHIUM, LITHIUM COMPOUNDS, MAGNESIUM, MAGNESIUM COMPOUNDS, MAGNESIUM, MAGNESIUM COMPOUNDS, SILVER COMPOUNDS DESCRIPTORS:

 $\widehat{\Xi}$ selection of possible electrode combinations to provide secondary cells using molten-salt electrolytes and ceramic materials for separators and packaging of the cells. Experimental resuits are presented for molten salt cells using chloride and fluoride electrolytes in the following couples: This report presents a general approach to the Li . AgCI/g, Mg . NiCI2/Ni, Ai . (Author)

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UNCLASSIFIED

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UNCLASSIFIED

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ZOMOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

AD- 275 475

MONSANTO RESEARCH CORP EVERETT MASS

RESEARCH ON ORGANIC DEPOLARIZERS

GRUBER, B. A.; MCELHILL, E. A.;

DA36 0395C87336 CONTRACT:

## UNCLASSIFIED REPORT

DESCRIPTORS: \*BROWIDES, \*CARBON BLACK, \*CATHODES (ELECTROLYTIC CELL), \*CYCLOHEXANES, \*ELECTRIC POTENTIAL, \*ELECTROCHEMISTRY, \*ELECTRODES, \*ELECTROLYTIC CELLS, \*FLUORIDES, \*MAGNESIUM, \*MAGNESIUM COMPOUNDS, \*NITROBENZENES, \*ORGANIC COMPOUNDS, \*OXIDIZERS, \*POLARIZATION, \*PRIMARY BATTERIES, 33 DESCRIPTORS: \*SYNTHESIS

\*NITRO RADICALS IDENTIFIERS:

SYNTHESIS OF ORGANIC CC - OUNDS FOR DEPOLARIZATION OF PRIMARY BATTERIES HAVING HIGHER VOLTAGES AND CAPACITIES THAN THE MG/MGBR2/M-DNB SYSTEMS.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

MELPAR INC FALLS CHURCH VA

A THIN-PLATE BATTERY

3

3

AMBROSE, J.F.; SMIT, J.; NGW-60-0362 62 CONTRACT:

## UNCLASSIFIED REPORT

DESCRIPTORS: \*MINIATURE ELECTRICAL EQUIPMENT, \*PRIMARY BATTERIES, \*STORAGE BATTERIES, \*WET CELLS, AMMONIA, ANODES (ELECTROLYTIC CELL), CARBON, CATHODES (ELECTROLYTIC CELL), CONTAINERS, DESIGN, ELECTRICAL PROPERTIES, LITHIUM, MAGNESIUM, MIXTURES, NITROBENZENES, TESTS, THEORY, THIOCYANATES

solution gives improved performance, as compared with the KCNS previously used. Additionally, study of the primary effects noticeable in the examination of characterized by nonuniform utilization of the anode area. This is often termed electrolyte the catholyte has shown that the optimum activity is Major effort was directed toward achieving improved understanding of the factors controlling cell and intake, permitting faster feeding of the electrolyte, and a better balance between rate of activation and rate of discharge, which results in an over-all lower average current density. Test results indicate clearly that the utilization of NH4SCN as the solute in the electrolyte NH3 of an in rease in aperture size of the electrolyte battery discharge characteristics, at drain rates corresponding to high current densities. One of starvation. The best remedy to date has consisted obtained with slurry prepared cathodes having a discharged cells, is an incomplete activation, 45% carbon, proportions expressed by weight. composition of 45% m. DNB, 10% NH4SCN and (Author)

ZOM07 SEARCH CONTROL NO. DOC REPORT BIBLIOGRAPHY

AD- 274 993

UNIVERSAL MATCH CORP MARION ILL

RESEARCH AND DEVELOPMENT DIRECTED TOWARD THE DEVELOPMENT OF GAS GENERATORS

3

CONTRACT: DA36 0395C87352

## UNCLASSIFIED REPORT

MAVES, \*MAGNETIC FIELDS, \*PLASMAS(PHYSICS), \*SHOCK WAVES, AMMONIUM COMPOUNDS, ARMING DEVICES, CARBON BLACK, CARRIDGES, CHEMICAL ANALYSIS, CHROMATOGRAPHIC ANALYSIS, COMBUSTION CHAMBER GASES, DESIGN, EXHAUST GASES, OGNOBUSTION, SOURCES, PREPARATION, STORAGE, ZINC COMPOUNDS (U) DESCRIPTORS: \*GAS GENERATING SYSTEMS, \*GUIDED MISSILE

3 Signal Corps metal-tube electrolyte-reservoiraCTIVATING SY M P ROP LLA I VESTIGA IO FI URE EVALU ION TEST , AND PRESSURE-VSTIME TESTING O. TWO PROPELLANT FORMULATIONS WERE STUDIED. Propellant evaluations are being coduct do determine wether or not the thermal stability of the two commercially available propellants will equal or surpass propellant N-18 5. The sealed match has proven effective for ig i i g e gas generators under various temp rature co di ion i cluing 300 F FOR ! \* DUR E REDESIGNED ST FIXTURE HAS PROVED SATISFACTORY. (Author) IMPROVED GAS GENERATORS ARE BEING STUDIED TO ACTIVATE ZINC-SILVER DXIDE BATTERIES EMPLOYING THE

#### UNCLASSIFIED

SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

RADIO CORP OF AMERICA SOMERVILLE N J

HIGH CAPACITY MAGNESIUM BATTERIES

3

NOV 61 35P LOZIER,G.S.;RYAN,R.J.; CONTRACT: DA 36-039-sc-85340 PRDJ: 3A 99-09-002

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*DRY BATTERIES, \*ELECTROLYTIC CELLS, \*POWER SUPPLIES, \*PRIMARY BATTERIES, ANDDES (ELECTROLYTIC CELL), CATHODES (ELECTROLYTIC CELL), CHEMICAL REACTIONS, COPPER COMPOUNDS, CORROSION, DESIGN. ELECTRIC POTENTIAL, ELECTROCHEMISTRY, ELECTROLS, ELECTROLYTES, HEAT TRANSFER, MAGNESIUM COMPOUNDS, MERCURY COMPOUNDS, **DXIDES, PERCHLORATES, STORAGE** 

reserve cell at an 8-min discharge rate by using a thin plate construction. Capacity based on element wt. and volume was 39 whr/lb and 4.5 whr/cu in. operation. An efficient heat sink must be used at high discharge rates to control voltage tolerance. The use of a water sink permits good operation at rates as low as the 7-min rate. A cathode efficiency of 88% was obtained with a HgD discharge showed the heat is due to the irreversibility of the Mg anode and to corrosion. The heat must be controlled for efficient discharge showed this alloy has characteristics similar to AZ-31 alloy. Impedance of AZ-21 Mg-Mg(C104)2-Mn02 A-size cells was slightly lower than comparable AZ-10 alloy cells. Delayed action and impedance measurements of Mg(AZ-10)-Mg(C104)2-Mn02 and Cu0 cells stored for 1 yr showed no significant difference from initial fresh-cell results. Cell An analysis of heat evolved during Mg-cell Delayed-action studies of AZ-21 Mg-Mg(C1O4)2 MnO2 cells on a tranceiver-tyne

3

capacities averaged 90%. (Author)

AD- 274 993

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

3 THERMOELECTRIC GENERATORS AND MATERIALS. RADIATION EFFECTS, RELIABILITY, LIFETIME, AND FAILURE. AN ANNOTATED BIBLIGGRAPHY

GRAZIAND, E.; JAN 62 11

UNCLASSIFIED REPORT

\*RADIOISOTOPE BATTERIES, \*FAILURE (MECHANICS),
\*RADIOISOTOPE BATTERIES, \*THERMOELECTRICITY, AGING
(PHYSIOLOGY), GENERATORS, MATERIALS, NUCLEAR ENERGY,
NUCLEAR POWER PLANTS, RADIATION EFFECTS, REACTOR FUELS,
RELIABILITY, SELENIUM, TELLURIUM, COMPOUNDS(U)

considerably to include selected references to other thermoelectric devices and material when any mention was made of factors that might cause failure or reason, the scope of the bibliography was broadened purpose was to bring to light any information regarding reliability, lifetime, and mean time of failure of thermoelectric generators and materials circ its, radiation effects, and sublimation. The results indicate that almost nothing exists in the due to oxidation, cracking, galvanic action, short generators in space, which would directly convert research on the problems of using thermoelectric heat from nuclear sources, into electricity. The This literature search was conducted as part of technical literature concerning lifetime and malfunction. (Author)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

BASIC STUDIES ON FUEL CE\$ L SYSTEMS

3

CAMPA, A. B.; CHIN, M.; 62

UNCLASSIFIED REPORT

\*FUEL CELLS, \*ALKALINE BATTERIES, \*ELECTROLTIC CELLS,
\*FUEL CELLS, AMMONIA, ANDDES (ELECTROLYTIC CELL),
CATHODES (ELECTROLYTIC CELL), DESIGN, ELECTROCHEMISTRY,
FORMALDEHYDE, FUELS, HYDRAZINES, NICKEL, PLATINUM,
PRIMARY BATTERIES, STORAGE BATTERIES DESCRIPTORS:

System were evaluated. Preliminary results were obtained with alkalne 0 and air cthodes. The most feaible systems were the aqueous N2H4 and the aqueous NH3-0 or air fuel cells. Evidence that NH4 is anodically oxidzed through H as an intermediate in alkaline electrolyte was obained. Reduction of the surface area of the N2H4 black optimization with respect to N2H4 decomposition rate and anode polarization. N2H4 anode gases were analyzed at closed and open circuits. N2H4 was consumed at the cathode in multiple-cell fuel NH3 to nitrate and nitrite at 150 C. The black anodes, and the intermediate NH3-0 fuel cell Cells. The molten caustic NH3 anode oxidized The alkaline, aqueous N2H4, NH3 and CH2O Pt CH20 anode had poor life in alkaline electrolyte. (Author)

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DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 272 289
NAVAL ORDNANCE LAB CORUNA CALIF

FOURTH SYMPOSIUM ON AMMONIA BATTERIES AT UNIVERSITY OF CALIFORNIA, BERKELEY, CALIFORNIA, JANUARY 25-26, 1962

JAN 62 1 REPT. NO. 559 UNCLASSIFIED REPORT

DESCRIPTORS: \*AMMONIA, \*STORAGE BATTERIES, \*SYMPOSIA, \*WET CELLS, ANODES (ELECTROLYTIC CELL), CATHODES (ELECTROLYTIC CELL), DYNAMOTORS, ELECTRODES, MEASUREMENT, POLARIZATION, POWER SUPPLIES, SOLVATES, THERMODYNAMICS

use of meta-dinitrobenzene as a depolarizer/cathode material in the ammonia battery; Ammonia slaked batteries; An application of thermodynamic methods determination of the mechanism of the S cathode in solvents for electrolyte application in batteries; Contents: Reference electrodes for laboratory and battery purposes; Contribution to the chemistry of thiocyana? solutions, The oxidation potential of Ca.in liquid ammonia; Investigation components from practical cell measurements; The Theoretical analysis of current distribution in polarization measurements; Selecting nonaqueous liquid ammonia; and A study of new cathodeanode mDNB cell reactants and products; Polarization Analytical methods and results on Mg/KSCN-NH3/ to the estimation of potentials of heavy metal sulfate-ammonia batteries; An application of thermodynamic methods of estimation to the Electrodes in liquid ammonia electrolytes; porous electrodes: Analysis of transient of cell reactions of Li-dinitrobenzene; couples in nonaqueous solvents.

#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. 20MD7

AD- 270 870

GULTON INDUSTRIES INC METUCHEN N J

NICKEL-CADMIUM BATTERIES

3

JAN 61 1V RAMPEL, GUY; DAGNALL, R.; CONTRACT: AF33 600 41670 MONITOR: ASD TR61 34

## UNCLASSIFIED REPORT

DESCRIPTORS: \*ALKALINE BATTERIES, \*STORAGE BATTERIES, ALUMINUM ALLOYS, CADMIUM, CADMIUM COMPOUNDS, CERAMIC MATERIALS, HYDROXIDES, IMPREGNATION, MANUFACTURING, NICKEL, NICKEL COMPOUNDS, OXYGEN, POWER SUPPLIES, RECOMBINATION RAMUET ENGINES, SATELLITES (ARTIFICIAL), SEALING COMPOUNDS, SEALS (STOPPERS), TEST METHODS (

Research and development leading to improved, long life, reliable, high watt-hour-per pound, sealed nickel-cadmium batteries are reported. Fundamental studies on electrode mechanisms were treated theoretically. Improved techniques were developed to impregnate active material into electrodes so as to gain increased output. Studies were made of the parameters involved in a sembling sealed cells so as to acrieve high overcharge capability without sacrificing capacity. Development progressed on techniques to produce ceramic-to-metal terminal seals; mechanical configurations and designs of prototypes were worked out. Five possible designs of prototypes were worked out. Five possible designs of requirements are discussed. (Author)

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(n)

GULTON INDUSTRIES INC METUCHEN N J

THE TESTING OF HERMETIC SEALS AND SEPARATORS, POSITIVE PLATE STUDIES, AND INVESTIGATIONS ON THE UNIFORMITY OF SEALED NICKEL-CADMIUM CELLS

SEIGER, H.N.; CONTRACT: DA36 0395C85390 61

## UNCLASSIFIED REPORT

PESCRIPTORS: \*ALKALINE BATTERIES, \*BATTERY SEPARATORS, \*SEALS (STOPPERS), \*STORAGE BATTERIES, ANODES (ELECTROLYTIC CELL), CADMIUM, CERAMIC MATERIALS, DESIGN, ELECTRODES, MANUFACTURING, METAL SEALS, NICKEL, SOLDERING ALLOYS, TESTS, WELDING

pressure increases, dua to release of oxygen gas by these cells are given. lests of 3 plate cells were carried out at 165 F. Overcharge tests on the HS series cells continued. The capacity after each charge was determined, and it is shown that charge below 500 ma resulted in decreasing capacity. If the nickel-oxide electrode. In 4 of 5 experimental cells, the pressure decreased again because of the reaction at the negative electrode. Tests on the completed. Discharge of the lithiated electrodes Spectrophotochemical and electrochemical methods cover-to-can seals to be made and permitted the cells are evacuated at the end of charge, the Special welding techniques have enabled final were evaluated. While both seem equally satisfactory, the electrochemical method has doped nickel-oxide electrode at 100 F were resulted in less total oxygen evolved. additional applications. (Author)

3

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

3 NICKEL CADMIUM CELLS FOR USE IN PORTABLE INSTRUMENTS AND SEVERAL METHODS OF RECHARGING THEM NAVAL RADIOLOGICAL DEFENSE LAB SAN FRANCISCO CALIF

> REPT. NO. TR540 DEC 61

UNCLASSIFIED REPORT

HOPTON, R.L.;

DESCRIPTORS: \*ALKALINE BATTERIES, \*BATTERY CHARGERS, \*RADIATION MEASURING INSTRUMENTS, \*STORAGE BATTERIES, \*SUBMINIATURE ELECTRONIC EQUIPMENT, CADMIUM, MOBILE, NICKEL, POWER SUPPLIES, RELIABILITY, SILICON, SOLAR CELLS, TESTS

3

3 Considered. A universal, series regulator type charger is discussed which will charge these cells in the constant voltage mode. Also discussed is a nickel cadmium rechargeable cells under consideration for sealed and nonsealed portable instrument systems. Temperature, discharge rate, capacity, rechargeability and interchangeability were found generally satisfactory where the different terminal voltage requirements per cell were compatible with the existing instrument. Types of cells ranging from the D size down to a button type of 50 ma-hr capacity were tested and methods of recharging them silicon solar cell charger for use where adequate An evaluation is presented of several types of light is available. (Author)

SEARCH CONTROL NO. ZOMD7 DDC REPORT BIBLIDGRAPHY

EAGLE-PICHER CO JOPLIN MO AD- 269 545

3 AND EVALUATION OF A CADMIUM - SILVER OXIDE BATTERY HAVING A HERMETICALLY SEALED CONSTRUCTION RESEARCH INVESTIGATIONS LEADING TO THE DEVELOPMENT

DA36 0395C85370 CONTRACT:

UNCLASSIFIED REPORT

BATTERIES, \*WET CELLS, CADMIUM, CADMIUM COMPOUNDS, DESIGN, ELECTROLYTES, GLASS SEALS, LIFE EXPECTANCY, OXIDES, DXYGEN, POWER SUPPLIES, RECOMBINATION REACTIONS, DESCRIPTORS: \*INSULATION, \*MATERIALS, \*STORAGE SILVER COMPOUNDS, TESTS
IDENTIFIERS: \*INSULATION, \*MATERIALS

3 assembled elements disclose that multiple layers of a cadmium in a sealed cell construction are presented with a discussion of data revealing the importance of controlling the volume of electrolyte in assuring negative active materials revealed the positive to be considerably more efficient than the negative plate. materials. Analysis of cycle life test data on fully at high and low temperatures on complete assemblies satisfactory recombination. Environmental testing separator of the membrane type will be required. Capacity efficiency measurements of positive and materials is described with data presented on 7 Factors affecting recombination of oxygen and An accelerated me nod of evaluating separator indicated a progressive greater rate of selfwere conducted. Retention-of-charge testing discharge as stand temperature increased. different combinations of insulating (Author)

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

COAST GUARD WASHINGTON D C

SHELF LIFE OF 90-VOLT BATTERY FOR SEADROME LIGHT O'CONNELL, J.M.; 1 SEP 61

3

UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, \*PRIMARY BATTERIES,
AIRPORTS, BUDYS, COAST GUARD RESEARCH, DEGRADATION, LIFE
EXPECTANCY, MARKER LIGHTS, MARKERS, STORAGE, TESTS (L

and ampene-hour capacity tests indicated that storage Guard seadrome light as a test load, operating time A study was made of the effect of shelf life on the type X-511 batteries which were within 2 weeks of performance of two 90-v dry cell batteries. Four Bungess type 3M60 batteries stored for 14 months and 4 Eveready type X-511 batteries stored for 9 months were tested in comparison with 4 Eveready performance for the storage periods indicated under conditions prevalentAT THE Coast Guard their manufacture. Using the standard Coast Supply Center had no effect on battery.

3

AD- 267 592

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AD- 269 545

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

GENERAL MOTORS CORP KOKOMO IND DELCO RADIO DIV AD- 266 351

3

SILVER OXIDE-ZINC BATTERY PROGRAM

RHYNE, JOHN JR.; CONTRACT: AF33 600 41600 MONITOR: ASD TR61 36

## UNCLASSIFIED REPORT

PESCRIPTORS: \*ELECTROLYTIC CELLS, \*STORAGE BATTERIES, \*WET CELLS, BIBLIOGRAPHIES, CONTAINERS, DESIGN, ELECTRIC CURRENTS, ELECTRIC POTENTIAL, ELECTRIC POWER PRODUCTION, ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, GASES, 3 HYDROXIDES, MATERIALS, MEMBRANES, OPERATION, OXIDES, PLASTIC SEALS, PLASTICS, POTASSIUM COMPOUNDS, PRESSURE, SATELLITES (ARTIFICIAL), SEALS (STOPPERS), SILVER COMPOUNDS, SPACECRAFT, ZINC DESCRIPTORS:

3 included gas producing reactions at both the negative and positive plates, pressure control, effect of alloying elements on the voltage characteristics of the positive plate, production of a molded terminal seal resistant to KDH leakage. A sealed cell was constructed and cycled over a 20% capacity range for 590 cycles. The pressure change was from a 10 p A study was made of the Ag io migration within the cell during cycling. Di tribution of Ag in the various layers of separator was determined asA FUNCTION OF THE NUMBER OF CYCLES. A comprehensive st. Jy of the Zn electrode was partially completed. The effect of current density and certain addition materials was determined in terms of Zn particle material were established. Other investigations size increase during cycling. Methods of controlling Zn penetration of the separator i vacuum to a 9 psi positive pressure.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DUC REPORT BIBLIOGRAPHY

SPRAGUE ELECTRIC CO NORTH ADAMS MASS AD- 266 153

INDUSTRIAL PREPAREDNESS MEASURES ON SOLID ELECTROLYTE BATTERIES

> 61

WILLIAMS, S.B.; CEELY, A.G.;

UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, AUTOMATION, DESIGN, ELECTROLYTES, INDUSTRIAL EQUIPMENT, INDUSTRIAL PRODUCTION, MANUFACTURING, PRIMARY BATTERIES, PRODUCTION, QUALITY CONTROL, SCHEDULING, SOLIDS DESCRIPTORS:

3

3 solved by adjusting the content of the cathode mix. A general description of cell assembly equipment is proble of substandard low-temp rature readings was including a new size requirement for the bat ery. Qualification testing was successfully completed. Various specification changes are described, given. (Author)

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

AD- 265 969

IIT RESEARCH INST CHICAGO ILL

CHEMICAL CONVERSION OF WASTE HEAT TO ELECTRICAL

ENERGY

MCCULLY, C. ROLAND 61 26P 3182 6

NOW-60-0760 REPT. NO.

## UNCLASSIFIED REPORT

DESCRIPTORS: \*ELECTRICITY, \*HEAT, \*POWER SUPPLIES, \*PRIMARY BATTERIES, ABSORPTION, ANDDES (ELECTROLYTIC CELL), ANTIMONY COMPOUNDS, ARMOR PIERCING AMMUNITION, CATHODES (ELECTROLYTIC CELL), CHEMICAL REACTIONS, CHLORIDES, COMPLEX COMPOUNDS, COPPER COMPOUNDS, ELECTROLYTIC CELLS, ENERGY, EUTECTICS, MELTING, MERCURY COMPOUNDS, POTASSIUM COMPOUNDS, SODIUM COMPOUNDS, THERMODYNAMICS, TIN COMPOUNDS (U)

the latter 2 systems w s accomplished, but separation of the products was not inherent, as it was with the first ystem. A method of selective absorption in a development is directed toward larger systems and second and third systems. Thermal regeneration of Regeneration was easily accomplished. Continuing galvanic cells are also being developed for the Selection of systems for continuing development toward improvement of current density. Larger was operated as a miniature integrated unit. include (1) (ASCIS)-ASCI3; SbCI3-SbCI5 at 300600; (2) HgCI2-HgCI; Hg-HgCl at 480-950; and (3) CuCI2-CuCI; TeCI2-TeCI4 at 480-950 K. The first system KCINACI eutectic is being developed.

3 afforded promising galvanic cells, but require more ary being developed. The system, CuCl2-CuCl; SnCl2-SnCl4 at 480-2000 K, severe material during regeneration. (Author)

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

NATIONAL CARBON CO INC CLEVELAND OHIO

3 FEASIBILITY STUDY ON HIGH PERFORMANCE, SHORT DURATION POWER BATTERIES

3

SENDEROFF, S.; KLOPP, E.M.; KRONENBERG 2 SEP 61

CONTRACT: NORD18240

## UNCLASSIFIED REPORT

3 DESCRIPTORS: \*CATHODES (ELECTROLYTIC CELL), \*POWER SUPPLIES, \*PRIMARY BATTERIES, BLACKBODY RADIATION, BLOOD PLATELETS, CARBONATES, CHLORIDES, DIFFUSION, ELECTROLYTES, EUTECTICS, FEASIBILITY STUDIES, IONS, LITHIUM COMPOUNDS, MATERIALS, MEASUREMENT, DXIDES, PHOSPHATES, POTASSIUM COMPOUNDS, RADIOCHEMISTRY, SILICATES, SILVER, SOLUBILITY, SULFATES, SULFIDES, SULFUR, THERMAL BATTERIES

The first step in this investigation was the calculation of the theoretical output of a large number of thermodynamically feasible systems. The systems which were shown by these calculations to be theoretically capable of producing the required power density were investigated further. Since the cathodic portion of any thermal battery is generally to determine the volume of the battery, and from this, assuming an over-all efficiency of 50 per cent, a simple cubic shape and black body radiation, the battery operating temperature was calculated as being approximately 1100 C. Since such a temperature examination of potential cathodic materials. The power density specifications as set forth were used agreed to be the limiting element, and since anodic would lead to a host of problems, not only with the battery components themselves, but also with the reactions, the investigation was confined to the reactions are better understood than cathodic materials of construction, a lower operating

PAGE

3

temperature is necessary. (Author)

EAGLE-PICHER CO COPLIN MO

3 RESEARCH INVESTIGATIONS LEADING TO THE DEVELOPMENT AND EVALUATION OF A CADMIUM - SILVER OXIDE BATTERY HAVING A HERMETICALLY SEALED CONSTRUCTION

CONTRACT: DA36 0395C85370

UNCLASSIFIED REPORT

DESCRIPTORS: \*STORAGE BATTERIES, \*WET CELLS, CADMIUM, CADMIUM COMPOUNDS, DESIGN, ELECTRODES, ELECTROLYTES, HYDROXIDES, LIFE EXPECTANCY, OXIDES, POTASSIUM COMPOUNDS, SILVER COMPOUNDS, TESTS DESCRIPTORS:

3 readily reproduced, rechargeable cadmium - silver oxide battery having a high level of reliability and performance. An excess of 400 c was obtained on the standard control cells utilizing 25% of the cells' capacity during each discharge. Several types of film separators have become available, and testing of these separators was initiated. Cells the 5-hour rate. Overcharge at higher rates is somewhat limited by the dissipation rate of the heat Development was continued on a hermetically sealed, were fabricated which will accept an overcharge at indication of the discharge characteristics of the control cells. Only limited results were obtained given off during the combination of oxygen and from the open circuit stand tests at various cadmium. Open circuit stand tests give an temperatures. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

AD- 264 807

SONOTONE CORP ELMSFORD N Y

3 DESIGN AND MANUFACTURE OF SEALED NICKEL-CADMIUM CELLS OF CYLINDRICAL DESIGN TO SIGNAL CORPS TECHNICAL REQUIREMENT SCL-7504

ALLIEGRO, FRANCIS J.; 61 MAY

UNCLASSIFIED REPORT

3 DESCRIPTORS: \*ALKALINE BATTERIES, \*STORAGE BATTERIES, CADMIUM, DESIGN, MANUFACTURING, NICKEL, TESTS

separator and spiral core has reached 4000 c at the 20% depth of discharge. At this point the end of charge voltage was 1.46 and end of discharge voltage was 1.18. Life cycling of D size cells with polypropylene separator has reached 1700 c. wall and the ends and edges of the stack-ups. The 10 A.H. cell design incorporates 2 sizes of plates, while the 50 A.H. and 100 A.H. each have 3 sizes of plates. Other final design features are as follows: (1) both terminals and vent on same end of cell. (2) flat end plates for cell container, (3) teflon seals, (4) non-woven polypropylene separator, (5) .023 in. positive and negative plates with 9 square inches of positive plate per incorporates rectangular stack-ups for the core in all 3 sizes of cells. The core is immobilized by means of nylon wedges placed between the cylinder prototype which successfully passed the vibration requirements of SCL-7504. The design A design was established of the fourth series insulated from cell container, (7) cell case material of stainless steel, and (8) 1.4 Sp. Gr. KOH electrolyte. Life cycling on early Prototypes (10 A.H.) which contain paper A.H. of nominal capacity, (6) terminals

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

RADIO CORP OF AMERICA SOMERVILLE N AD- 264 419

HIGH CAPACITY MAGNESIUM BATTERIES

3

LOZIER, G.S.; RYAN, R.J.; ^ MAY 61

UNCLASSIFIED REPORT

3 BATTERIES, \*DRY BATTERIES, \*POWER SUPPLIES, \*PRIMARY BATTERIES, ANDDES (ELECTROLYTIC CELL), CATHODES (ELECTROLYTIC CELL), CAPPER COMPOUNDS, DESIGN, ELECTRODES, ELECTROLYTES, ELECTROLYTIC CELLS, LITHIUM COMPOUNDS, MAGNESIUM, MAGNESIUM COMPOUNDS, MEASUREMENT, MERCURY COMPOUNDS, DXIDES, PERCHLORATES, SILVER COMPOUNDS, TESTS DESCRIPTORS:

3 Data is presented which shows the beneficial effects on reserve cell initial voltage characteristics by the addition of silver (I) oxide solutions as a function of temperature were carried out over a temperature range of +75 F to -45 F. drains. Mg(ClO4)2/HgO reserve cell is summarized at the thirty minute rate. Data at -4 and -40 F is also included. Conductivity studies of magnesium perchlorate and lithium perchlorate Anode efficiencies of AZ-21XA magnesium in 2N Mg(ClO4)2 with 1.0 g LiCrO4 and 0.5 g Mg(OH) per liter are summarized for various to the mercuric oxide athode mix. Watt hour continuous and intermittent tranceiver type Comparison of discharge characteristics of Mg(C104)2/MnO2 (Type M) and Mg/Mg(C104)2/CuO A-size cells with AZ-10 capacity data for a ive-ampere-hour Mg/ and AZ-21XA magnesium alloy is given.

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMD7 DDC REPORT BIBLIOGRAPHY

GULTON INDUSTRIES INC METUCHEN N AD- 264 218

SILVER-CADMIUM BATTERIES

3

RAMPEL, GUY; SHAIR, R.C.; CONTRACT: AF33 600 42397 2 6

UNCLASSIFIED REPORT

3 COMPOUNDS, \*STORAGE BATTERIES, BATTERY SEPARATORS, BIBLIOGRAPHIES, DESIGN, ELECTRODES, IMPREGNATION, METAL PLATES, MILITARY REQUIREMENTS, NICKEL, OXIDES, POROUS METALS, PREPARATION, SILVER, SPACE ENVIRONMENTS DESCRIPTORS: \*ALKALINE BATTERIES, \*CADMIUM. \*SILVER

been conducted. Included are all items of interest relative to previous development effort and their Efforts leading to improved, long life, reliable, high whr/lb, sealed Ag-Cd batteries were initiated. A comprehensive literature survey has meeting the desired performance requirements are proposed and discussed. (Author) silver oxide-electrode and comparison data on a current capabilities. Data are given on special commercial plate. Design recommendations for

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AD- 264 218

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ZOMO2

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 263 422

EDISON (THOMAS A) INDUSTRIES WEST DRANGE N J

HIGH CAPACITY VENTED NICKEL-CADMIUM CELLS

 $\Xi$ 

NOV 60 1V KOPPER,EDWARD C.;MILLER,W. RALPH; CONTRACT: DA36 0395C84555

## UNCLASSIFIED REPORT

DESCRIPTORS: \*ALKALINE BATTERIES, BATTERY SEPARATORS, CADMIUM, CELLULOSE, COBALT, DESIGN, ELECTRIC CURRENTS, ELECTRIC POTENTIAL, ELECTROLYTES, HYDROXIDES, IMPREGNATION, LITHIUM COMPOUNDS, MANUFACTURING, NICKEL, NICKEL COMPOUNDS, NITRATES, NYLON, POTASSIUM COMPOUNDS, STORAGE BATTERIES, TESTS

The development of 6 sizes of high capacity, vented Ni-Cd cells to meet Signal Corps
Requirement SCL-7505A and the manufacture of 300 cells of each of the 6 sizes was completed.
All cells were given 3 conditioning cycles during which the capacity at the 5-hr (0.2C sub 5) rate was determined for each cell. Capacity tests were made on 6 representative cells of each type at the 0.2C sub 5 r...e at 80 and -40 F and at the 3C sub 5 r...e at 80 and -40 F and at the 3C sub 5 r...e at 80 and -40 F and at the 10.2C sub 5 r...e at 80 and -40 F and at the 3C sub 5 r...e at 80 and -40 F and at the 10.2C sub 5 r...e at 80 and -40 F and at the 20.04-in. thick, negative plates 0.037-in. thick, a nylon taffeta/cellophane/nylon taffeta separator 5-to 6-mil thick. Vacuum impregnation was used for both positive and negative plates and contable for both positive and negative plates and the positive impregnation bath. Li04 (ca. 9 g/l) was added to the KOH electrolyte to promote initial capacity and possibly increase cycle life.

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#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMOT

AD- 263 382 DEDMANENTE EDINOATION GOSDITAL CARLAL

PERMANENTE FOUNDATION HOSPITAL DAKLAND CALIF
VENTED NICKEL-CADMIUM E-41 ALARM BATTERY (DEVELOPMENT

MAR 61 1V JANUSZKIEWICZ, STANLEY;

## UNCLASSIFIED REPORT

DESCRIPTORS: \*STORAGE BATTERIES, \*TOXIC AGENT ALARMS, ACCEPTABILITY, ALKALINE BATTERIES, BATTERY COMPARTMENTS, CADMIUM, DESIGN, GAS DETECTORS, MINIATURE ELECTRICAL EQUIPMENT, NICKEL, POWER SUPPLIES, SHOCK RESISTANCE, TESTS, VIBRATION (U)

A cycling unit was designed and built to perform the life cycle tests on the E-41 alarm battery. Considerable electrical trouble was experienced with the motor generator charging source. The initial battery capacities were lower than expected from our previous acceptance test data. This was traced to insufficient overcharge of the positive plate. In view of the fact that the attainment of complete charge of the positive plates after the capacity cycle could not be readily accomplished by extending the constant potential current. The batteries successfully passed the two hundred (200) charge — discharge cycles. (Author)

PAGE

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

RELIABILITY STUDY. HIGH RATE LECLANCHE WAFER UNITED STATES ELECTRIC MFG CORP NEW YORK

APR 61 1" SULKES,MARTIN; CONTRACT: DA36 039SC85266

## UNCLASSIFIED REPORT

DESCRIPTORS: \*DRY BATTERIES, MANUFACTURING, RELIABILITY, SMALL TOOLS, TORPEDO COMPONENTS (U)

subsequently replaced. Phase III, the testing of wafer cell batteries, has been partially completed for the first eleven (11) lots produced. All testing after three months storage has been completed has been completed. Work on the project has advanced into phase III. The tool, jigs and dies necessary for the completion of phase I were completed within the allotted time period without pencountering any unusual problems. New methous production of the wafer cell units were developed necessitating minor adjustments of equipment also accomplished within the required time period. proceeded as scheduled except that one (1) lot of high temperature batteries was destroyed by previously used for prior contracts. These were Manufacture of the seventeen (17) lots of wafer cell units as described in the Signal Corps Technical Requirements SCL-7510 with revisions malfunctioning of the heat chamber. These were Phases I and II, tooling and pilot production, or lot a to s. (Author)

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

COAST GUARD WASHINGTON D C AD- 262 511

3 COMPARATIVE DISCHARGE TESTS OF BATTERY POWER SUPPLIES FOR MINOR LIGHTS

2 REPT. NO. 255 6

3

## UNCLASSIFIED REPORT

DESCRIPTORS: \*NAVIGATION COMPUTERS, \*RELIABILITY, \*STORAGE BATTERIES, BEACON LIGHTS, DRY BATTERIES, ELECTRIC DISCHARGES, ELECTRICAL EQUIPMEN", LIFE EXPECTANCY, LIGHTHOUSES, POWER SUPPLIES, RESISTANCE (ELECTRICAL), TESTS, WET CELLS DESCRIPTORS:

3

3 effect is discussed in internal battery resistance on versus delivered ampere hours are presented. The battery systems for aids to navigation were comparatively tested by discharging each system through the same flashing lamp load. Curves of open and closed circuit voltage versus time and the effective candlepower of the flashing lamp. Six different batteries used in Coast Guard (Author)

PAGE

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 262 437

NAVAL RESEARCH LAB WASHINGTON D C

THE SILVER OXIDE-ZINC ALKALINE PRIMARY CELL. PART V. COMPARISON OF POTASSIUM HYDROXIDE, CESIUM HYDROXIDE, AND RUBIDIUM HYDROXIDE ELECTROLYTES

JUL 61 15P REPT. NO. NRL-5635

SP SHEPHERD, C.M.; LANGELAN, H.C.;

UNCLASSIFIED REPORT

DESCRIPTORS: \*ALKALINE BATTERIES, \*ELECTROLYTES,
\*PRIMARY BATTERIES, CESIUM COMPOUNDS, DENSITY,
ELECTRICAL PROPERTIES, ELECTRODES, HYDROXIDES, OXIDES,
PHYSICAL PROPERTIES, POTASSIUM COMPOUNDS, RUBIDIUM
COMPOUNDS, SILVER, SILVER COMPOUNDS, SOLUBILITY,
VISCOSITY, ZINC, ZINC COMPOUNDS

Preliminary work has been done on determining the capacities of the silv: oxide-zinc alkaline cell when using CsOH or RbOH solution as an electrolyte. All the discharges were made using high-purity, sheet-zinc negative electrodes. It was found that the cell capacity, within limits, is directly proportional to electrolyte volume, to electrolyte concentration, and to the amount of CsOH or RbOH present in the electrolyte.

At a given set of discharge conditions, the maximum capacity that could be obtained using CsOH or RbOH electrolytes was considerably less than could be obtained from KOH when compared on a weight basis. On a volume basis KOH was slightly better than CsOH or RbOH. (Author)

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#### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 262 008

ELECTRIC STORAGE BATTERY CO MADISON WIS RAY-0-VAC DIV

DEVELOPMENT OF A LIGHTWEIGHT, WATER-ACTIVATED BATTERY FOR A SUPERHET RADIOSONIDE

JUL 60 1V HONE

V HONER, HAROLD N.;

UNCLASSIFIED REPORT

DESCRIPTORS: \*POWER SUPPLIES, \*WATER ACTIVATED BATTERIES, DESIGN, PRODUCTION, RADIOSONDES

3

A program was set up to develop a lighweight, water-activated battery for a Superhet radiosonde. Experience obtained from the fulfillment of production contracts of similar battery packs was utilized to arrive at a battery having the required capacity, and possessing a reliable construction at a reasonable cost. The final design was a battery pack 2-1/2 in. in height, 6-7/16 in. long and 4-11/16 in. wide weighing approximately 560 g dry and 875 g activated. Average capacities are 188 min at moderate temperature, 207 min at low and high-low temperature tests. (Author)

UNCLASSIFIED

AD- 262 437

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIDGRAPHY

INDUSTRIAL PREPAREDNESS MEASURES ON SOLID ELECTROLYTE SPRAGUE ELECTRIC CO NORTH ADAMS MASS

BATTERIES

3

-6 S

WILLIAMS, S. B.; CEELY, A.G.;

UNCLASSIFIED REPORT

\*STORAGE BATTERIES, \*ELECTROLYTIC CELLS, \*STORAGE BATTERIES, ELECTROLYTES, MANUFACTURING, PRODUCTION, QUALITY CONTROL, SOLIDS, TEMPERATURE, TEST METHODS, TESTS DESCRIPTORS:

3 Qualification testing was successfully completed on 60 pre-production batteries. Thirty of the units were stored for 90 days at room temperature followed by 30 days of storage at 155 F. The other 30 units were stored for 30 days at 155 F. Each group was divided into half, one half being subjected to capacitor duty cycling at -25 F and the other half to duty cycling at 125 F.

#### UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO.

HARRY DIAMOND LABS WASHINGTON D C

3 AN INVESTIGATION OF THE DYNAMICS OF THE ELECTROLYTE DISTRIBUTION SYSTEM IN THE PS502-502A POWER SUPPLY SCILLIAN, GLENN L.; EMMONS, CONANT H.; 1 JUL 61

UNCLASSIFIED REPORT

\*PRIMARY BATTERIES, \*STORAGE BATTERIES, \*WET CELLS, DIAPHRAGMS (MECHANICS), ELECTRODES, FAILURE (MECHANICS), MECHANICAL PROPERTIES, MICROPHOTOGRAPHY, OXIDES, SILVER COMPOUNDS, STRESSES, TESTS, ZINC DESCRIPTORS: \* ELECTROLYTIC CELLS. \* POWER SUPPLIES

DESCRIPTORS: \*Electrolytic cells, \*Power supplies, \*Primary b tt ries, \*We cells, \*Storg b ri I PHR G S ( EC A ICS , F il ur ca ics ICROP O OGRAP Y IL V R COMPOUNDS, Oxides RESS . The motion of the pumping diaphrengm in the electrolyte reservoir of the PS502-502A power supply w s studied during idofl rept o R- % ( Proj. nos 30233 DESCRIPTORS: \*Electrolytic cells, \*Power supplies, \*Primary b tt ries, \*We cells, \*Storgbies, \*Primary b tt ries, \*We cells, \*Storgbies, \*I PHR G S ( EC A ICS , F il urcalics of the COMPOUNDS, Oxides R CI % B % OF TR PAR PRI RY PURPO OF THE IV S IG IO R OR ICU OF OCC - IO AL IP R G F ILUR TH T LE O ELECTRICAL FAILURE OF THE BATTERY AND TO FIND DESCRIPTORS: \*Electrolytic cells, \*Power sup plies, \*Primary b tt ries, \*We cells, \*Storg b ri I PHR G S ( EC A ICS , F il ur c a ics ICROP O OGRAP Y IL V R COMPOUNDS, Oxides TI TROD S, Mechanical prupply by G L L CILLI N AND C DNANT H. Emmons. 24 July 1, 34p.; clillus. bl DOFL REPT O R- %( Proj. nos 30233 nd 7 85) Unclassified repor

UNCLASSIFIED

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PAGE

pressurized gas and. (2) improper folding of he

diaphragm during activation.

MEANS OF ELIMINATING THE CAUSES. The failures were found to be due to excessive mechanical str ss cau ed, in turn, by (1) high-pres ure shock from the etonating squibs used to release the stored

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 261 477 NAVAL AIR ENGINEERING CENTER PHILADELPHIA PA AERONAUTICAL STRUCTURES LAB

A PROTOTYPE ELECTRONIC SYSTEM FOR CONTROL OF STORAGE BATTERY POWER (U)

JUL 61 10 FRIEDMAN, RICHARD;

## UNCLASSIFIED REPORT

DESCRIPTORS: \*AERODYNAMIC HEATING, \*ELECTRONIC
EQUIPMENT, \*STORAGE BATTERIES, \*TEST FACILITIES,
\*VOLTAGE REGULATORS, ALFERNATING CURRENT, CONTROL
SYSTEMS, ELECTRON TUBES, HIGH TEMPERATURE, PHASE SHIFT
CIRCUITS, POWER SUPPLIES, PROGRAMMING (COMPUTERS),
SIMULATION, THYRATRONS
IDENTIFIERS: IGNITRONS
(U)

A 100 kw prototype electronic system for controlling storage battery power was developed which employs ignitron control tubes, a special pulse transformer, and a unique phase shifter. Photographs are presented of waveforms appearing in various portions of the control system. The system waveforms are compared with the waveforms of a back-to-back ac ignitron control system. (Author) (U)

#### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 260 819
HARRY DIAMOND LABS WASHINGTON D C

TECHNICAL REVIEW NO. 5, JULY 1961

3

6

JUL

## UNCLASSIFIED REPORT

DESCRIPTORS: \*ANTENNAS, \*DRY BATTERIES, \*INTERMEDIATE FREQUENCY AMPLIFIERS, \*SUBMINIATURE ELECTRONIC EQUIPMENT, \*TELEMETER SYSTEMS, AMPLIFIERS, ANTENNA RADIATION PATTERNS, AUDIO FREQUENCY, BROADBAND, CIRCUITS, DESIGN, ELECTRIC FILTERS, ELECTRICAL NETWORKS, ELECTROCHEMISTRY, FREQUENCY MODULATION, HIGH PASS FILTERS, LOW PASS FILTERS, MATHEMATICAL ANALYSIS, MINIATURE ELECTRICAL EQUIPMENT, MODULATION, RADIOFREQUENCY FILTERS, SLOT ANTENNAS, TELEMETERING (U)

Contents: A 2D 30-Mc IF amplifier
Azimuthal pattern of slotted array antennas on a cone Complementary filteringA new electrochemical system for high voltage, low ice \$7.60
Bepartment of the Army, Washington, D. C. MISSILES AND VENTURES INTO SPACE 1960-1961
REPORT. June 61, 81p. incl. illus. (Pamphlet no. 70-5-9) Unclassified report DESCRIPTORS: \*8ibliography, \*\*Guided missiles, Rocketurrent drain \*\*Applications

3

EASTMAN KODAK CO ROCHESTER N Y

HIGH ENERGY BATTERIES

ARD ED 670 NORD18249 CONTRACT: REPT. NO.

UNCLASSIFIED REPORT

\*PRIMARY BATTERIES, \*STORAGE BATTERIES, \*POWER SUPPLIES, \*PRIMARY BATTERIES, \*STORAGE BATTERIES, \*TORPEDO COMPONENTS, CARBON, CATHODES (ELECTROLYTIC CELL), DESIGN, EFFECTIVENESS, ELECTROCHEMISTRY, ELECTROLYTES, MAGNESIUM, SULFUR COMPOUNDS, WET CELLS (U) DESCRIPTORS:

3 = energy battery based on the use of the magnesiumsulfur couple in an electrolytic solution liq id ammoni indicate that it is possible to obtain as much as 50 watt-hours per pound of cell structure (electrodes, electrolyte, and spacers) at a 15-minute rate. Translation into an aut at considerably lower and higher temperatures with nearly the same output. Whereas such a ba tery appears to be competitive with other automatically matically activated battery would probably reduce this value to less than 20 watthours per pound. activated reserve batteries, especially for lowtemperature service, it delivers about 7% of the Therefore, it is concluded that the feasibility very high energy batteries was not demonstrated. and 20 C. The attery could presumably be used little change in output between -40 C An investigation into the feasibility of high desired output of 250 watt-hours per pound. There i

#### UNCLASSIFIED

SEARCH CONTROL NO. ZOMD7 DDC REPORT BIBLIOGRAPHY

GULTON INDUSTRIES INC METUCHEN N J AD- 260 629

3

3 THE TESTING OF HERMETIC SEALS AND SEPARATORS, POSITIVE PLATE STUDIES, AND INVESTIGATIONS ON THE UNIFORMITY OF SEALED NICKEL-CADMIUM CELLS

SEIGER, H.N.; MAR 61 1V SI CONTRACT: DA36 039SC85390

UNCLASSIFIED REPORT

3 DESCRIPTORS: \*ALKALINE BATTERIES, \*ANODES (ELECTROLYTIC CELL), \*BATTERY SEPARATORS, \*SEALS (STOPPERS), \*STORAGE BATTERIES, CADMIUM, CERAMIC MATERIALS, DESIGN, ELECTRODES, METAL SEALS, NICKEL, TEST METHODS DESCRIPTORS:

of 9 and 102 minutes respectively. A third sel -discharge process is also occurring, but no data has nickel has 2 sources of oxygen which have half-times being one oxygen source undergoing sequential decay. been obtained on this. the doped electrodes have 2 capacity, Tafel slope and pressure slope. Several cell with a ratio of negative to positive capacity near unity, were brought into several different states of charge. These cells were ten pressured with oxygen and the pressure decrease The potential decay data is reported as t e Tafe! obtained. The question of oxygen adding capacity to a cell was investigated, and a negative answer obtained. The oxygen evolution data was analyzed self-discharge processes which are suspected of on a phenomenological basis. The theory of the Ceramic-to-metal seals are now produced consistently. Accelerated testing of separator materials was completed, and the properties of separators are reviewed. Overcharge data were obtained on 6 cells. The data consists of the analysis was developed. It appears that pure slopes. (Author)

AD- 260 700

3

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 260 515 CDAST GUARD WASHINGTON D HYDROGEN ACCUMULATION IN THE BATTERY POCKETS OF BUOYS WITH LEAD-ACID BATTERIES (U)

JUL 61 1V

## UNCLASSIFIED REPORT

DESCRIPTORS: \*BUGYS, \*STORAGE BATTERIES, ELECTRICITY, HYDROGEN, MATHEMATICAL ANALYSIS, MEASUREMENT, TESTS, VALVES, VENTILATION DUCTS (U)

This report is a comprehensive study of the causes and prevention of hydrogen gas accumulation in electric lighted buoys powered by leadacid storage batteries. The chemistry of bossible causes of hydrogen evolution is discussed. Measurements of hydrogen concentration in various lighted buoys are presented. Results showed a high percentage of buoys with explosive mixtures in battery pockets. Increasing the size of ventilation tubing and converting to an open-type vent valve reduced the hydrogen gas concentration below the lower explosive limit. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIDGRAPHY SEARCH CONTROL NO. ZOMO7

AD- 260 153
NATIONAL CARBON CO INC CLEVELAND OHIO

FEASIBILITY STUDY ON HIGH PERFORMANCE, SHORT DURATION POWER BATTERIES (U)

SENDEROFF,S.: CONTRACT: NORD18240

# UNCLASSIFIED REPORT

DESCRIPTORS: \*CATHODES (ELECTROLYTIC CELL), \*POWER SUPPLIES, \*PRIMARY BATTERIES, CHLORIDES, DETERMINATION, DIFFUSION, ELECTRIC POTENTIAL, ELECTRODES, ELECTROLYTES, ELECTROLYTIC CELLS, EUTHIUM COMPOUNDS, MATERIALS, MEASUREMENT, PHOSPHATES, POTASSIUM COMPOUNDS, POTENTIOMETERS, REDUCTION, SALTS, SILVER, SOLUBILITY, (U)

DESCRIPTORS: \*Power supplies. \*Primary bat teries. \*Cathodes (Electrolytic cell), Materials, Potassium compounds, Lithium Compounds, Chlorides, Sulfates, Eutectics, Electrolytes, Electrodes, Salfs, Solubility, Electric potential, Potentiometers, Reduction, Measure ment, Determination, Electrol tic cells, Diffusion, Phosphates, Silver. Open-ended Terms: Thermal batteries. The diffusion coefficient of Ag in KCI-LiCI was determined. The value differed from data obtained by Chronopotentiometry by a factor of 7. The experiment is to be rerun using radioactive tracer techniques for greater sensitivity. About 250 test cells, principally involving CuD, variou sulfates, and phosphates, were prepared and evaluated. Based on active material alone (anode weight plus the calculated amount of cathodic material for complete reaction) CuD gave a maximum of 282 whr/lb; the phosphates and sulfates gave maximum of 1751 whr/lb while the sulfates gave 141 whr/lb; CuD on the same basis gave 182.4 whr/lb.

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SEARCH CONTROL NO. ZOMO7

DOC REPORT BIBLIOGRAPHY

AD- 259 160

EVALUATION OF IMPROVED BATTERY FILLER CAPS FOR USE WITH WINTERIZATION KIT FOR M48A2 TANK

ARMY ARCTIC TEST CENTER FORT GREELY ALASKA

3

REPT. NO. ATB 2 331

# UNCLASSIFIED REPORT

33 DESCRIPTORS: \*STORAGE BATTERIES, \*TANKS (COMBAT VEHICLES), POLAR REGIONS, SEALS (STOPPERS), TESTS IDENTIFIERS: M-48 TANKS

3 Service tests were made to determine the extent the improved battery filler caps corrected the battery heating system deficiency. The Improved Battery Filler Cap is a battery cell cover that provides an acid tight seal of the cell opening. It contains two vent openings that baffle the gases and prevents loss of electrolyte when splashed against the underside of the cap. The cap is threaded and contains a rubber gasket that seals between the top of the cell opening and the cap when the cap is screwed into the opening. It is fabricated from a hard rubber material capable of withstanding more heat than the standard cap. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

ELECTRIC STORAGE BATTERY CO YARDLEY PA AD- 258 899

INVESTIGATION OF AGO PRIMARY BATTERIES

3

WYLIE, G.M.;

MAY 61 1V WY REPT. NO. E 11 61 CONTRACT: DA36 039SC78319

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*OXIDES, \*PRIMARY BATTERIES, \*SILVER COMPOUNDS, BATTERY SEPARATORS, ELECTRODES, ELECTROLYTES, ELECTROLYTIC CELLS, HYDROXIDES, POTASSIU" COMPOUNDS, STORAGE, TESTS, WET CELLS, ZINC

3 Experimental Zn/KOH/AgO sealed flat plate cells delivered 75 whr/lb and 6.25 whr/cu in. at the 5-hr rate to 84 whr/lb and 7 whr/cu in. at the 100-hr rate. Experimental unsealed cells retained 46 to 50% of their new capacity after 6 wk storage at 160 F. No improvement in cell performance was obtained at -30 F. (Author)

AD- 258 899

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AD- 259 160

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMO7

ABERDEEN PROVING GROUND MD

ENVIRONMENTAL TEST OF NICKEL-CADMIUM STORAGE BATTERIES

3

ALD DES OTA 42 KENYON, L.W.;

UNCLASSIFIED REPORT

DESCRIPTORS: \*ALKALINE BATTERIES, \*STORAGE BATTERIES, CADMIUM; CLIMATE, DESERT TESTS, DESIGN, NICKEL, TESTS(U)

Environmental tests of ten 2HN and ten 6TN type nickel-cadmium batteries were conducted while installed in test and facility vehicles operated over various types of terrain at Yuma Test Station, Yuma, Arizona. Cell vent release plugs failed to function at prescribed pressures resulting in cell failures in all the ba.teries. It is recommended the durability of the nickelcadmium battery be considered satisfactory when the deficiencies in the cell vent plug are consected and that the configuration of future batteries be improved to make them more compatible with the battery boxes of existing ordnance vehicles. (Author)

### UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. ZOMOT

0- 257 358

ELECTRO-OPTICAL SYSTEMS INC PASADENA CALIF

ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK, VOLUME VI - CHEMICAL SYSTEMS

3

SEP 60 1V MENETREY.W.R.: CHRISNEY, J.; REPT. NO. 390 F V6 CONTRACT: AF33 616 6791

UNCLASSIFIED REPORT

DESCRIPTORS: \*COMBUSTION, \*FUEL CELLS, \*HEAT ENGINES, \*POWER SUPPLIES, \*PRIMARY BATTERIES, \*SPACE FLIGHT, \*STORAGE BATTERIES, CADMIUM, DRY BATTERIES, \*ELECTROCHEMISTRY, ELECTRODES, ENERGY CONVERSION, GAS TURBINES, GENERATORS, HYDRAZINES, HYDROGEN, LIQUEFIED GASES, LIQUID ROCKET PROPELLANTS, MERCURY, NICKEL, OXYGEN, PROPELLANTS, SILVER, STORAGE, THEORY,

3

Power systems which use chemical fuel as the energy source appear useful in a variety of spaceAPPLICATIONS, AND OFFER WEIGHT ADVANTAGES FOR DURATIONS BELOW ABOUT 100 HOURS. A discussion is presented on primary and secondary batteries, primary and regenerative fuel cells, reciprocating engines using hydrogen and oxygen bipropellant, monopropellant and bipropellant turbines and cryogenic storage of H and O. The theoretical and practical performance of the converters is reviewed, and the weight of various systems is predicted. Other factors besides power system weight may lead to the selection of a chemical system in preference to others. For example, liquid H provides an excellent heat sink for environmental control. While batteries may be approaching the limits of their capability, major advances still will be accomplished in the fuel cell and dynamic engine area. For durations of more than several hours possible by 1970. (Author)

PAGE

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

RADIO CORP OF AMERICA SOMERVILLE N J AD- 257 341

3 PRIMARY CELLS UTILIZING ORGANIC COMPOUNDS AS THE ACTIVE COMPONENTS

NOV

UHLER, E. F.; RYAN, R.J.;

# UNCLASSIFIED REPORT

33 DESCRIPTORS: \*ORGANIC COMPOUNDS, \*PRIMARY BATTERIES, CARBON, CATHODES (ELECTROLYTIC CELL), DRY BATTERIES, FURANS, HETEROCYCLIC COMPOUNDS, HYDRAZINES, MAGNESIUM, MAGNESIUM COMPOUNDS, MATERIALS, NITRO RADICALS, NITRORENZENES, PYRIDINES, WATER

IDENTIFIERS: NITRO RADICALS

(1) DESCRIPTORS:

3 performance of the magnesiumdinitrobenzene cell and a summary of the capacity, shelf-life, delayed action, group type and position in a molecule and its effect suitable for military applications, and to exploit the use of untried organic materials for the purpose of obtaining maximum usefulness from this new class of battery materials. A detailed discussion of the dinitrobenzene dry cell with a capacity of 90 whr/lb on ca hode potential is presented for the aromatic present laboratory-made cells into practical form, is described. The theony concerning the effect of materials. The more important classes of organic nitro and nitroalkane compounds and extended to anode materials, hydrazine, and organic cathode heterocyclic nitro compounds and organic anode efficiency upon cell performance were studied. Various cell configurations (round and flat) impedance, and temperature-dependence data is presented. The roles of C and H20 in the mwere evaluated to provide design criteria for materials, nitropyridines and nitrofurans are Attempts were made to develop the best of the dinitrobenzene cathode and the effect of Mg optimum cell structures. A magnesium-mdiscussed in greater detail. (Author)

### UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIDGRAPHY

ELECTRIC STORAGE BATTERY CO MADISON WIS RAY-0-VAC DIV

3 LOW TEMPERATURE BA-2270/U-XLT-1 BATTERIES

PAULSON, J.W.; 2 61

# UNCLASSIFIED REPORT

3 DESCRIPTORS: \*DRY BATTERIES, \*ELECTROLYTES. \*LOW TEMPERATURE BATTERIES, BATTERY SEPARATORS, BROMIDES, CHLORIDES, LIFE EXPECTANCY, LITHIUM COMPOUNDS, PRODUCTION, STORAGE BATTERIES, TEST EQUIPMENT, TESTS

3 testing of production run batteries at -40 F, -20 F and 70 F. The lithium chloride electrolyte was employed in combination with a separator designated Six months delayed results are reported for inplant as CP-2 paper. (Author)

UNCLASSIFIED

390

AD- 256 412

UNCLASSIFIED

SEARCH CONTROL NO. ZOMO7 DOC REPORT BIBLIOGRAPHY

NAVAL AMMUNITION DEPOT CRANE IND

3 AN ANALYTICAL METHOD FOR THE DETERMINATION OF ARGENTIC OXIDE (AGO) AND SILVER OXIDE (AG20) IN ZINC-SILVER OXIDE BATTERIES

KLAUSMEIER, R.E.; REPT. NO. QE C 61 44 61

UNCLASSIFIED REPORT

DESCRIPTORS: \*CHEMICAL ANALYSIS, \*PRIMARY BATTERIES, \*SILVER COMPOUNDS, ALKALINE BATTERIES, DETERMINATION GRAVIMETRIC ANALYSIS, OXIDES, TEMPERATURE

3 An analyical method has been developed for the determintion of argentic oxide (AgO) and silver oxide 9ag20) in zinc-silver oxide batteies. The developed method requires only a furnace, porcelain crucibles, and an analytical alance. The method is based on the weight of oxygen liberated uring the thermal decomposition of the silver oxides. The expemenal wok inudes the mogravimetro and differential themalanalyses OF METALLIC SILVER, SILVER DXIDE, AND ARGENTIC DXIDE. (Author)

### UNCLASSIFIED

ZOWOZ SEARCH CONTROL NO. DDC REPORT BIBLIOGRAPHY

AD- 254 456

RADIO CORP OF AMERICA SOMERVILLE N

HIGH CAPACITY MAGNESIUM BATTERIES

3

AUG 60 1V LOZIER,G.S.;RYAN,R.J.; CONTRACT: DA 36-039-SC-85340 PRDJ: 3G-18-03-001-01

UNCLASSIFIED REPORT

3 BATTERIES, CHEMICAL REACTIONS, COPPER COMPOUNDS, DESIGN, ELECTROCHEMISTRY, ELECTRODES, ELECTROLYTES, HEATING, MAGNESIUM, MAGNESIUM COMPOUNDS, OXIDES, PERCHLORATES ( \*DRY BATTERIES, \*POWER SUPPLIES, \*PRIMARY DESCRIPTORS:

Mg/Mg(ClOd)2 CuO reserve cells were characterized on high rates using a cell design previously developed. Several voltage variations, caused by the heat evolved, were noted during discharge. A research study was initiated to determine the mechanism by which the heat evolved delayed action, impedance, and capacity retention influences the voltage behavior of the system. Shelf-life programs were initiated to study the capacity data are presented for the Mn02 cells. characteristics of the Mg/Mg(ClO4)2/ MnO2 and Mg/Mg(ClO4)2/CuO dry cells. Initial delayed action, impedance and (Author)

3

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PAGE

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SEARCH CONTROL NO. ZOMO7 DDC REPORT BIBLIOGRAPHY

JOHNS HOPKINS UNIV SILVER SPRING MD APPLIED PHYSICS AD- 252 681

3 DEVELOPMENT OF THE POWER SUPPLY OF THE TRANSIT SATELLITE

SCOTT, W.C.; >

CM 986 NORD7386 REPT. NO.

# UNCLASSIFIED REPORT

33 DESCRIPTORS: \*PHOTOELECTRIC CELLS (SEMICONDUCTOR),
\*PHOTOTUBES, \*POWER SUPPLIES, \*SATELLITES (ARTIFICIAL),
\*SOLAR CELLS, \*STORAGE BATTERIES, CADMIUM, DESIGN,
DOPPLER NAVIGATION, ELECTRONIC EQUIPMENT, NAVIGATION,
NICKEL, OXIDES, SILICON, SILVER COMPOUNDS, SOLAR
RADIATION, TELEMETERING DATA, TESTS, ZINC
(U)

parameters are known, an observer's location can be accurately determined. The development of this concept into a complete navigation system is being pursued. This report covers the development of the Transit Navigation Satellite power system and deals with the silicon photovoltaic converters, the rechargeable nickelcadmium batteries, the zinc-silver oxide batteries used in an early version, and the static conversion equipment. The requirements and test conditions are discussed with data presented which summarizes the telemetered data from the 3 Project Transit is the code name of a program aimed at achieving a world-wide, all-weather navigation system. The system is based on the fact that the orbital parameters of an earth satellite can be determined by analyzing the doppler frequency shift in radio frequency signals transmitted by the orbiting vehicles. (Author)

CORPORATE AUTHOR - MONITORING AGENCY

MERCURY CELL BATTERY INVESTIGATION AD- 296 906 NICKEL-CADMIUM STORAGE BATTERIES \*ABERDEEN PROVING GROUND MD

DPS OTA

INVESTIGATION OF NEW CATHODE-ANODE COUPLES FOR SECONDARY BATTERIES USING MOLTEN SALT ELECTROLYTES. ASD-TDR63 115

\*AEROJET-GENERAL CORP AZUSA CALIF

AD- 258 329

INVESTIGATION OF AN ENERGY

CONVERSION DEVICE

AD- 277 285

AD- 402 884

STATE OF CHARGE INDICATORS FOR NICKEL CADMIUM BATTERIES.
AD- 406 134 ASD-TDR63 191

**GSEALED SILVER-CADMIUM BATTERY** ASD-TDR63 560 INVESTIGATION. AD- 418 143

ASD-TDR62 1 NEW CATHODE-ANODE COUPLES USING

NONAQUEDUS ELECTROLYTES

AD- 277 171

\* \* \*

ASD-TDR62 4

\*AERONAUTICAL SYSTEMS DIV WRIGHT-

PATTERSON AFB OH

SILVER MIGRATION AND TRANSPORT MECHANISM STUDIES IN SILVER OXIDE-ASD-TDR63 863 ZINC BATTERIES.

EVALUATION OF NEW CATHODE-ANDDE COUPLES FOR SECONDARY BATTERIES

\* \*

AD- 277 197

ASC-TDR62 19

INVESTIGATION AND FLIGHT TEST OF ION EXCHANGE MEMBRANE FUEL CELLS

NICKEL-CADMIUM BATTERIES

AD- 275 983

ASD-TDR62 67

AD- 276 272

\* \* \* ASD-TR61 34

AD- 421 049

NICKEL-CADMIUM BATTERIES AD- 270 870

SILVER OXIDE-ZINC BATTERY ASD-TR61 36 AD- 266 351 PROGRAM

TEST REPORT ON SEALED SILVER OXIDE-ZINC SECONDARY CELLS ASD-TR61 636 AD- 276 649

METAL CELLS
AD- 284 891

ASD-TDR62 397

DEVELOPMENT OF SEALED SILVER

ASD-TDR62 668

OXIDE-ZINC SECONDARY BATTERIES

AD- 291 646

\* \* \*

ASD-TDR62 837

ROSPACE CORP EL SEGUNDO CALIF CHEMISTRY AND PHYSICS LAB TR-0079(4970-10)-2 \*AEROSPACE CORP

Separator Materials for a Silver Zinc Ceil Vent. Evaluation of Liquid-Gas (SAMS0-TR-79-23)

NEW CATHODE-ANODE COUPLES USING NONAQUEOUS ELECTROLYTES

ASD-TDR62 1112

\*AEROSPACE CORP EL SEGUNDO CALIF LAB OPERATIONS

Penetration of Cadmium into Nylon Separators of Ni-Cd TR-0074(4270-10)-3 Batteries,

(SAMSO-TR-74-17) AD- 774 562 \*AEROSPACE RESEARCH LABS WRIGHT-PATTERSON AFB OH

FEASIBILITY STACKING
PHOTOVOLTAIC
ZN SULFIDES, SELENIDES, AND
TELLURIDES FOR CONVERSION OF SUN
RADIATION INTO ELECTRICAL POWER,
PREPARATION AND GROWTH, SINGLE
CRYSTALS AND THIN FILMS; THEORY; PROPERTIES. \* ARL-62 395 ELECTRICAL

for the Removal of Heat During the An Intercell Planar Heat Pipe Cycling of a High Rate Nickel Cadmium Battery, ARL-71-0223

\* \* \*

AD- 288 060

\*AIR FORCE AERO PROPULSTON LAB WRIGHT~ PATTERSON AFB CH

ALKALINE BATTERY EVALUATION. AFAPL-TDR-64-76 AD- 602 676

SILVER MIGRATION AND TRANSPORT MECHANISM STUDIES IN SILVER DXIDE-AFAPL-TR-64-144 ZINC BATTERIES. AD- 610 563

LITHIUM-SILVER-CHLORIDE SECONDARY BATTERY INVESTIGATION AFAPL-TR-64-147 AD- 612 189

LITHIUM-NICKEL HALIDE SECONDARY \* \* \* AFAPL-TR-65-11

CORP AUTHOR-MONITOR AGENCY-1 UNCLASSIFIED AD-A067 210

WHICH CHANGE IN BATTERY PERFORMANCE SURVEY AND ANALYSIS ON METAL-AIR CELLS. Failure Mechanisms in Sealed Failure Mechanisms in Sealed LITHIUM-ANODE LIMITED CYCLE BATTERY INVESTIGATION. THE THERMAL PROPERTIES AND BEHAVIOR OF NICKEL-CADMIUM AND SILVER-ZINC CELLS AND THEIR SILVER-ZINC ELECTRODES AND SEPARATOR RESEARCH. MEASUREMENTS OF QUANTITIES LI-CL2 PRIMARY BATTER; INVESTIGATION. AFAPL-TR-67-48-PT-6 AFAPL-TR-67-104 \* \* \* AFAPL-TR-67-107 AFAPL-TR-67-89 AFAPL-TR-68-34 AFAPL-TR-68-41 AFAPL-TR-68-6 AND ANALYSIS. COMPONENTS. Batteries. Batteries. AD- 835 219 AD- 851 056 829 289 AD- 854 592 AD- 819 543 AD- 821 051 AD- 819 967 AD-AFAPL-TR-67-13
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AD- 838 775

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AFAPL-TR-67-48-PT-5

UNCLASSIFIED

FAILURE MECHANISMS AND ACCELERATED LIFE TESTS FOR

AFAPL-TR-68-83

AD- 836 554

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AFAPL-TR-67-48-PT-4 Failure Mechanisms

\* \* \*

Part IV.

AFAPL-TR-69-81

LITHIUM-NICKEL FLUORIDE SECONDARY BATTERY INVESTIGATION.

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AD- 834 300

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UNCLAS

AD- 861 077 \* \* \* \*

AFAPL-TR-69-90
Electrode Migration and
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Alkaline-Zinc Batteries.
AD- 862 506

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Accelerated Life Tests of NickelCadmium Batteries.
AD- 871 973

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Failure Mechanisms and
Accelerated Life Tests of NickelCadmium Batteries.

AFAPL-TR-70-44-PT-3
Failure Mechanisms and
Accelerated Life Tests of NickelCadmium Batteries.

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Battery.
AD- 727 066

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AFAPL-TR-71-74-PT-1 Simulated Orbital Life Tests for Spacecraft Cell;. Part I. Procedures and Manually Acquired

Data. AD- 736 471 AFAPL-TR-71-74-PT-2 Simulated Orbital Life Tests for Spacecraft Cells. Part II. Automatically Acquired Data, Review, and Recommendations.

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AD- 736 769

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AD- 741 838

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AD- 748 252

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AFAPL-TR-72-67
Rate of Discharge of
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AD- 748 253 \* \* \*

AFAPL-TR-72-85
Maintenance Free Battery
System, Model No. EMBC114C.
Battery System, Sealed Cell, Nickel
Cadmium, Integral Charge Control,
Aircraft.

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High Energy Density Sintered
Plate Type Nickel--Cadmium Battery
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Impregnation Methods to Produce
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for Aircrew Survival Transceivers.
AD-A004 543

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Secondary Power.

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Change in Zinc Secondary
Electrodes.

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AD-A059 295 \* \* \* \*

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Zinc-Silver Oxide Batteries AD- 717 497

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AD-A000 417

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CONTAMINATION VERSUS ELECTRICAL
PERFORMANCE OF SINTERED PLATE
NICKEL-CADMIUM AIRCRAFT BATTERIES.
AD- 806 812

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AD-A014 337

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for Emissive Expendable Electronic
Countermeasure Devices.

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Fabrication of Nickel-Hydroxide
Electrodes Using Electrochemical
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AD-A018 517

AFAPL-TR-75-34-PT-2
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Alkaline Battery Electrodes.
AD-A022 952

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An Indicator for the Detection of Sulphur Dioxide from Cells and Batteries.

\*AIR FORCE ARMAMENT LAB EGLIN AFB FL \* \* \* AFATL-TR-73-4 Multifunctional Explosive Battery.

AD- 909 147

\*AIR FORCE CAMBRIDGE RESEARCH LABS HANSCOM AFB MA \* \* \* AFCRL-62 742 NOVEL LIGHTWEIGHT SECONDARY BATTERY SYSTEM: LI-LI ION COUPLE ANODE: EXCHANGE RESIN CATHODE:\* AFCRL-62 858 SMALL HERMETICALLY-SEALED NICKEL-CADMIUM STORAGE BATTERIES AD- 288 700

AD- 290 326

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A THIN-PLATE BATTERY.
SUPPLEMENT TO THINFILM MONOTRONICS
AD- 614 471

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AD- 845 244

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STUDY OF KINETICS OF ALKALI METAL DEPOSITION AND DISSOLUTION IN NONAQUEOUS SOLUTIONS. AFCRL-68-0560 AD- 681 453

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Preferential Solvation Effects of Water on Electrode Reactions in Propylene Carbonate, AFCR1.-71-0333 AD- 726 814

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AD- 749 861

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\*ARINC RESEARCH CORP WASHINGTON D Silver-Zinc Batteries, AD-A054 444 4630-523

\*ARMY AIR MOBILITY RESEARCH AND DEVELDPMENT LAB FORT EUSTIS VA EUSTIS DIRECTORATE

Development of an Atroraft USAAMRDL-TR-74-81

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Battery Conditioner/Analyzer. AD-A005 055 \*ARMY ARCTIC TEST CENTER FORT GREELY ALASKA

ATB 2 331
EVALUATION OF IMPROVED BATTERY
FILLER CAPS FOR USE WITH
WINTERIZATIC: A KIT FOR M48A2 TANK
AD- 259 160

\*ARMY COMMUNICATIONS COMMAND FORT HUACHUCA AZ

ACC-SEIP-020
Standard Engineering
Installation Package.
Uninterruptible Power Facilities
(48 Voits d.c.).

\*ARMY ELECTRONICS COMMAND FORT MONMOUTH N J INST FOR EXPLORATORY RESEARCH \* \* \* \*

THIN-FILM TECHARGEABLE SOLID-ELECTROLYTE BATTERIES, 1D- 629 501

\*ARMY ELECTRONICS COMMAND FORT
MONMOUTH N J
\* \*
BATTERY-FUEL CELL SYSTEM:

\* \* \* MAGNESIUM PERCHLORATE RESERVE BATTERY, AD- 662 980

AD- 662 960

\* \* \* MAGNESIUM BATTERY PROGRAM AD- 663 002

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AD- 699 432

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743 214

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AD- 651 961

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SEALED NICKEL-CADMIUN BATTERIES.
AD- 654 057

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AD-A020 143

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ECOM-74-4235

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Disposal of the Lithium Organic-Environmental Consequences of Investigation of the Electrolyte/S02 Battery. ECOM-76-1752-F AD-A059 512

Long Shelf Life Organic \* \* ECOM-0076-F

Electrolyte Battery. AD- 726 385

High Energy Density, Long Life Secondary Battery (Silver-Zinc) Assembly BB 634 ()/U. ECOM-0093-F AD- 732 495

EVALUATION OF NI-FE AND NI-ZN \* \* \* ECOM-0102-1 BATTERIES. AD- 840 290

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High Energy Sealed Nickel-Zinc Batteries.

High Energy Sealed Nickel-Zinc ECOM-0114-S Batteries. AD- 755 550

ECOM-0116-1

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MAGNESIUM/MAGNESIUM PERCHLORATE/MANGANESE DIOXIDE BATTERIES FOR FIELD RADIO APPLICATIONS.

AD- 670 968

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STANDARD LINE-BATTERY ASSEMBLY
                                                                         Sealed Nickel-Cadmium Battery
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AD- 650 780
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    HIGH ENERGY SYSTEM (ORGANIC ELECTROLYTE).
                                                                                                                                                                   HIGH RATE PRIMARY ZINC/AIR
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ELECTROLYTE)
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                    AD- 676 867
                                                                                                                                                                                    BATTERY.
                                                        Low Temperature Electrochemical
                                                                                                                                                  Low Temperature Electrochemical
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                                                                                                                                                                                                                                                                                                                                                SEPARATORS FOR HIGH-RATE, NON-
                                                                                                                                                                                                                                        SEPARATORS FOR HIGH-RATE, NON-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   New Mechanically Rechargeable
Zinc/Air Battery Design.
AD- 762 573
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AD- 687 336
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      AD- 749 270
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                                                                             Systems.
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AIR STANDARD LINE BATTERY BA-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Low Temperature Electrochemical
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                                                                                                               Vented Nickel-Cadmium Battery
                                     Rechargeable Metal-Air Cell.
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                                                                                                                            Assembly, 88-651( )/U.
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                       ECCM-0257-F
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ORGANIC ELECTROLYTE HIGH ENERGY THE EFFECT OF CARBONATED ELECTROLYTE ON THE PERFORMANCE OF SINTERED PLATE NICKELCADMIUM CELLS, A PRELIMINARY STUDY OF FACTORS AFFECTING MAGNESIUM DRY CELL LOW-COST, HIGH-ENERGY CATHODES and PERFORMANCE OF RESERVE BATTERIES WITH ORGANIC OR MAGNESIUM PERCHLORATE ELECTROLYTE. DEVELOPMENT OF IMPROVED ZINC DRY PROCESS DIVALENT SILVER BATTERIES FOR HIGH TEMPERATURE STORAGE. Optimization of BA-4270/U BA-4386/PRC-25 Magnesium MnD2 CELL PERFORMANCE CHARACTERISTICS FOR MAGNESIUM PERCHLORATE COMPARATIVE HIGH RATE MAGNESIUM ROUND DRY \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* Primary Batteries. DENSITY BATTERIES. OXIDE ELECTRODES. ECOM-02565-F ECOM-02572-F ECOM-2694 ECOM-2749 ECOM-2844 ECOM-2880 ECOM-2559 ECOM-2561 BATTERIES. AD- 614 104 AD- 615 114 AD- 850 003 AD- 640 053 AD- 654 813 AD- 664 153 AD- 666 184 AD- 654 471 1 DEVELOPMENT OF THE SEALED ZINC SILVER OXIDE SECONDARY BATTERY SYSTEM. DEVELOPMENT OF CARBON-ZINC
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ZINC BB-5 BB-5 C- AD-70 TEMP TEMP AD-71 AD-71	DESIGN, FABRICATION OF PROTOTYPES, AND TESTING OF SEALED, RECHARGEABLE SILVER-CADMIUM CELLS. AD- 683 466  * * * * ACCEPTANCE TESTING OF SEALED, ACCEPTANCE TESTING OF SEALED, CYCLE LIFE TESTING OF SEALED, CYCLE LIFE TESTING OF SEALED, CYCLE LIFE TESTING OF SEALED, AD- 693 844  * * * ECOM-03359-F AD- 693 844  * * * ECOM-03359-F AD- 664 777  AD- 664 777  * * * ECOM-03359-F AD- 691 355  * * * ECOM-03359-F AD- 691 355  * * * ECOM-03359-F CYCLE LIFE TESTING OF VENTED, CYCLE LIF
GING THE SILVER-ZINC Y BATTERY SYSTEM. PAR N CHARACTERISTICS.  1159 ANICALLY RECHARGEABLE ERY.  117 ASSURANCE PROGRAM DE-ELECTROLYTE COMPOSI 0 * * * 1168 TENANCE-FREE LEAD ACID 6 * * * 1182	NEW DESIGNS FOR ZINC-AIR BATTERIES.  AD- 697 125  * * * *  ECOM-3213  * * * *  ECOM-3213  * * * *  ENGINEERING EVALUATION OF ZINC- SILVER OXIDE BATTERY BB-622B/U USED WITH RADAR SET AN/PS-5.  AD- 700 959  * * * *  ECOM-3219  * * * *  ECOM-3220  SYNTHESIS AND CHARACTERIZATION OF INTERMEDIATE COMPOUNDS INVOLVED IN THE ELECTROCHEMICAL REDUCTION OF M-DINITROBENZENE.  AD- 701 879  * * *  ECOM-3226  POPINITROBENZENE.  AD- 701 879  * * *  ECOM-3226  POOPINITROBENZENE.  AD- 866 228  * * *  HIGH ENERGY DENSITY, LONG LIFE,
ECOM-2949 STANDARD ALKALINE CELLS AND SECONDARY BATTERIES, AD-668 654  * * ECOM-2988 PORTABLE MILITARY CHARGER FOR ZINC-SILVER OXIDE BATTERIES. AD-673 717  * * * * ECOM-3047 STATE-OF-THE-ART ALKALINE CADMIUM ANODES. AD-680 169 * * * * ECOM-3054 FUEL CELL MANPACK POWER SOURCE. AD-680 894 * * * ECOM-3056 FEASIBILITY INVESTIGATION OF PLASTIC PARTS FOR VENTED, NICKEL-	CADMIUM BATTERY BB-607( )/U.  AD-680 893  ***  ECOM-3061  ***  AD-683 461  ***  ECOM-3085  CHARACTERISTICS OF m- DINITROSENZENE (m-DNB) DRY CELLS.  AD-684 916  ****  ECOM-3093  LIGHTWEIGHT, LOW TEMPERATURE RESERVE TYPE MAGNESIUM PERCHLORATE BATTERY BA-836()/U FOR MANPACK COMMUNICATION-ELECTRONIC EQUIPMENT.  AD-685 856  ***  ECOM-3104  FAST TRANSIENT RESPONSE FUEL CELL - BATTERY HYBRID POWER SOURCE.  AD-687 260  ***  ECOM-3105  SEPARATOR MATERIALS FOR THE LITHIUM-CHLORINE BATTERY.

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PROVING GROUND MD

\* \* \*
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AD- 785 584 \* \* \*

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HAWTHORNE

CALIF ENGINEERED MAGNETICS DIV

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CELL EQUALIZATION TECHNIQUES. (RTD-TDR63 4187)

\*MALLORY (P R) AND CP INC BURLINGTON
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\*MALLORY (P R) AND CO INC

INDIANAPOLIS IND

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MERCURY CELL BATTERY
INVESTIGATION

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MERCURY CELL BATTERY
INVESTIGATION

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TESTING AND EVALUATION OF

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